DATA LITERACY SKILLS – WHY ARE THEY SO IMPORTANT FOR GRADUATES? WHAT CAN BUSINESS SCHOOLS DO TO IMPROVE THE CURRENT SITUATION?

LIZ CUNNINGHAM

DBA

2021

DATA LITERACY SKILLS – WHY ARE THEY SO IMPORTANT FOR GRADUATES? WHAT CAN BUSINESS SCHOOLS DO TO IMPROVE THE CURRENT SITUATION?

Liz Cunningham

A thesis submitted in partial fulfilment of the requirements of the University of Northumbria at Newcastle for the degree of Professional Doctorate

Research undertaken in Newcastle Business School

March 2021

Abstract

The subject of digital literacy in the UK is of great interest at the moment in the context of business, education and citizens in general. There are concerns from Government that the UK is experiencing a digital skills gap, with businesses expressing a need for staff with basic or advanced digital skills. There is some concern expressed that young people (aged 16-24) do not have a high enough skill level to meet these needs.

Research has also identified that another current issue of great importance to business is the analysis and management of data. Data is easily generated and if it is dealt with appropriately and transformed into Business Intelligence it is a key business asset. Business Intelligence is a major driver in the gaining of competitive advantage.

Taking the above two topics into account, it is interesting that definitions of digital literacy rarely include any mention of data analysis and management. It would be expected that data literacy would form an important part of a digital skillset, particularly with regard to business. When young people take up employment in business, it can be assumed that it would be very useful for them to have a good set of data skills.

The identification of this gap was the starting point for this research, which was aimed at discovering how a range of stakeholders (business employers, students and academic staff) regarded the area of data literacy in the context of graduate employees. A qualitative approach was taken, as it was felt that the depth and richness of the data required could best be captured in this way.

In terms of data collected, employers were of the common opinion that graduate employees had good skills with technology in general but had often had poor data skills. Students agreed with this and also expressed the opinion that they found the data subjects taught at University were “too hard” with a concentration on statistical skills learned using spreadsheet tools with which they were unfamiliar. Academic staff agreed with this and expressed frustration that students were quick to disengage from the subject and did not understand its importance.

Further work carried out involved a sectoral analysis of HE standards and frameworks and an institutional analysis of teaching content at a number of University Business Schools. All Business Schools examined were found to take a very similar approach to the teaching of what could be identified as data literacy, using spreadsheets as a vehicle to teach a variety of statistical and quantitative techniques, with content comparable to that taught on BM9400 (Business Analysis for Decision-Making at Newcastle Business School..

A set of recommendations was developed based on the results of the primary data collection coupled with key points embedded in HE standards. These recommendations underpinned a different approach to data literacy teaching designed to more closely meet the needs of employers while also engaging students. This approach was applied to a new Level 3 module which successfully ran in Semester 1 of academic year 2020/21.

Table of Contents

List of Figures

List of Tables

Acknowledgements

There are a number of people who I would like to thank for their support through this DBA process.

First of all, I would like to thank my supervisors Professor Diane Sloan and Professor Andy Robson. They have motivated me and pushed me forward when I have found the process challenging. I could not have got to this point without them.

Thanks also to some very supportive colleagues who have cheered me on through this and been happy to listen to me talk about my research. Talking things through with these colleagues really helped me to understand where I was going. Good friends have also helped in this way, listening and sometimes proof-reading sections. Thanks particularly to Sue Richardson and Doreen Wright. Also, thanks to Dr. David Heading at Durham University. He told me I could do it!

I would particularly like to thank my husband, Matthew. He has been an endless source of support and encouraged me every step of the way. I am sure he is as happy as I am that the thesis it is now complete!

Declaration

I declare that the work contained in this thesis has not been submitted for any other award and that it is all my own work. I also confirm that this work fully acknowledges opinions, ideas and contributions from the work of others.

Any ethical clearance for the research presented in this thesis has been approved. Approval has been sought and granted by the Faculty Ethics Committee on 22/06/2018.

I declare that the Word Count of this Thesis is 61425 words (excluding tables)

Name: Liz Cunningham

Signature: *Liz Cunningham*

Chapter 1 – Introduction

1.1 Introduction to chapter

The overall purpose of this research is to examine the data management and analysis skills taught at Undergraduate level in the Newcastle Business School with a view to assessing how well the skills learnt contribute to the employability of graduates when they leave the Business School. Integral to the research is an exploration of the actual skills and knowledge required by business in the area of data management and analysis (data literacy) and the alignment of these with what is actually taught in this area in Business Schools. It is recognised that there is an ongoing debate about the feasibility of the direct transfer of skills between education and employment. At this point it must be noted that this thesis will not contribute to this debate. Research carried out here is concerned with an examination of how well skills learnt contribute to employability, specifically aligned to the data literacy skills which employers regard as important and necessary in business graduates.

This research will investigate existing theory within the areas of graduate employability and undergraduate data literacy skills, exploring and identifying areas where further contribution can be made. An appropriate philosophical approach will be adopted and this will inform research methodology and selection of research methods.

This Introductory chapter will start by examining my own motivations for conducting this research, as a data management and analysis professional, turned academic. This will lead to a statement of my Research Question and Research Objectives, arising from my experience and motivation. Following on from this, I will outline my rationale and justification for my overall approach to the study

I will then turn to a brief exploration of the concept of data literacy, as this concept underpins the whole study and is the basis for my first Research Objective. This will begin with a discussion of the concepts of Data, Information and Knowledge, defining how the components of the well-known Data, Information, Knowledge pyramid applies to the skills required by Business and Management graduates as

they enter employment. This will be followed by an examination of data literacy within the framework of other associated literacies, these being Information Literacy and Digital Literacy.

I will conclude this exploration by examining a selection of recent work carried out within this area, specifically with regard to current government and educational strategy and the gaps I have identified within these areas.

Finally, I will outline my proposed methodological approach to the study and summarise subsequent chapters.

1.2 Motivations of the Researcher

A long history of involvement with IT and data analysis projects in a wide variety of different organisations has given me an insight into how businesses actually manage data. I am interested in the use of data management tools to help organisations control, manage and improve, using software to interpret data at a high level and use data to inform business decisions. In the context of this Chapter, I will refer to this skillset as “data literacy”. This definition will be explored and justified more fully in Section 1.5 of this chapter and considered in detail in Chapter 2. As will be identified in Section 1.3, the first objective of this research will be to fully explore this term in the context of Business and Management students and employability.

My involvement with IT and data management projects came about as the result of setting up and running my own business as an IT/Business consultant. This business ran successfully from 1994 to 2013. During this time, I worked for a range of businesses from sole traders through to some of the large, Japanese manufacturing companies, principally those located in the North-East of England. I was generally involved on a project basis, responsible for designing and running training courses, helping managers and staff to develop bespoke spreadsheets and database systems. During this time, I was also involved in some part-time teaching at several HE Institutions, also all within the North-East of England.

When I made the decision to move into Higher Education on a full-time basis in 2013 my first role was as an IT Trainer at Durham University. I was responsible for designing and delivering courses to students at the three major levels of study, Undergraduate (UG), Post Graduate Research (PGR) and Post Graduate Taught

(PGT). It was during this role that I became aware that many students felt uneasy about their Business IT skills and were worried that their perceived lack of skills would have a detrimental effect on their employability prospects. Students felt that they had not gained enough IT and data management expertise in their education so far and were not learning to use “standard” IT and data management tools to a high enough level during their current studies. This was particularly true in the setting of the Business School, where I designed and delivered a range of courses in the advanced use of Microsoft Excel and Access, in an attempt to bridge the perceived gap. Discussions with academic staff in the Business School and Careers staff, both in the Business School and centrally, confirmed a general sense that Business students did not arrive at the University with an adequate degree of “data literacy” and did not gain sufficient skills during their degree courses to make them truly employable in this context.

Following on from my IT training role at Durham, I was employed in my current position as a Senior Lecturer at Northumbria University, in the Business School. Since my employment in the Business School, I have been involved in teaching on Business Analysis and Information Systems modules, teaching a range of IT skills, specifically the use of Microsoft Excel and Access, at Undergraduate levels 4 and 5. My involvement with these modules and conversations with students has served to confirm much of what I had observed at Durham. Students were very hesitant in their use of data management tools, both at a practical, operational level and also as an aid to examining and solving business problems. Other staff teaching on these modules have made the same observations and it is identified as an area of concern.

I felt that this subject was worthy of research, to attempt to define and understand the concept of data literacy and then to ascertain how the concept relates to the whole set of skills required by the truly employable graduate. If, as it appears, there is a skills gap in this area, this research could investigate the reasons for the gap in detail and make some suggestions as to how it can be closed.

In 1.3 I will develop the ideas that arose from my employment as a data management professional and also as an academic into an outline of the rationale for the study I am undertaking. This is split into two sections, the first is concerned with the growth of data skills in business and the second is how those skills are

linked to graduate employability. I intend to address both of these areas in this study and to explore them both in detail in Chapter 2.

1.3 Rationale – Growth of Data Skills in Business

This section of the Introduction is concerned with the growth and development of computer and data skills from the 1980s when the Personal Computer was first used in business up to the present day. Work carried out by the British Computer Society provides a useful lens through which to examine this development.

It is evident, that over the last half-century, the ability to use computer systems at a variety of levels and for a range of different purposes has become an integral part of most jobs and professions.

The British Computer Society celebrated its 60-year anniversary in 2017 with a series of quotes from their members publication "IT Now" in an attempt to chart the development of IT usage in business and industry over the last 60 years. In 1986 the following is quoted, taken from an article called "Skills shortages and the user", "*We need to take account of the changing need for IT skills which will arise from new tools and approaches*" (British Computer Society, 2017, p64). It can be argued that these new tools and approaches are the ones which over the next thirty years developed into what this thesis is defining as data literacy.

From the Autumn 2017 issue of IT Now, as part of the same series, the British Computer Society provided a timeline of what they perceive as major developments in the world of IT. For the period 1987-90, they comment that "*Advances in processing and graphical power enable computers to move out of the accounts department and to begin making their presence felt in all walks of human life*." (British Computer Society, 2017, p22) . This demonstrates that in the late 1980s/early 1990s with the advent of the Personal Computer use of Information Technology tools such as spreadsheets, word processing and (to a lesser extent) databases became part of the general Business environment and staff in most disciplines were required to develop skills in using them.

From that period up to the present day, the development of these skills was key to many types of employment in a wide range of business functions. In terms of literature, there is a comprehensive body of work available, dealing with the

increased “computerisation” in a wide range of jobs and the value of skills associated with it. I will address relevant literature in Chapter 2 of this thesis.

If we accept the importance of skills in the data management area and return to the question of graduate employability, we can see how important it is for Business and Management graduates to have the appropriate level of skill with Information Technology and data management tools in order for them to compete adequately in this area.

“*As the use of data increases, a sufficient supply of data skills becomes critical to the UK’s labour force. Therefore, it is timely that we examine data skills provision at universities, considering what skills our graduates need to succeed in a range of sectors*” (Universities UK, 2015, p1).

This report is now six years old. It would be interesting to see what progress has been made over these years. In Chapter 3 I will be conducting a critical review of data literacy teaching in a selection of UK Universities in an attempt to evaluate what current data skills provision looks like.

1.4 Rationale of the Study – Employability

In the previous section, work carried out by the British Computer Society was used to explore the growth of data skills in business from the 1980s to date. In this section, the concept of graduate employability will be explored, using the CABS “21st Century Leaders” reports. It is noted that the time period under examination in these two sections are not comparable. It is not intended that they should be. The growth of data skills in business has been a long process, as described by the British Computer Society. Graduate employability as an outcome of Higher Education is a much newer concept and it is therefore appropriate to consider it through the lens of business-orientated contemporary work captured in the CABS reports discussed below.

In 2014 the Chartered Association of Business Schools (CABS) delivered a report entitled “21st Century Leaders: Building Practice into the curriculum to boost employability”. A key finding of this report identified that “*employers want business schools to equip graduates with skills, as well as knowledge* “ (Chartered Association of Business Schools, 2014 p5). Recognition of the importance of graduate

employability led to several pieces of work, including an updated report, published in 2018, entitled “21st Century Leaders: Building employability through Higher Education”. 1,045 managers and 837 managers were surveyed for this report and its overwhelming message is that both sets of stakeholders believe that work-related skills should be built into the curriculum. Employability is seen as an issue of national importance (Chartered Association of Business Schools, 2018). For the purpose of this Introduction, I am addressing the issue of employability purely from the perspective of this report, as I believe it is worthy of discussion in its own right as a vehicle to discuss graduate employability from the perspective of data literacy skills.

Following on from this, research has identified a significant body of literature, frameworks and policies developed in response to the focus on Graduate Employability. Much of this will be explored in more detail in Chapter 2, however an important point to note is that, to date, there has been little consideration of the specific area under investigation here – data literacy in the context of graduate employability. Significantly, data literacy is not explicitly described as a concept and is not even implicit in many of the frameworks put forward dealing with the subjects of essential business skills or graduate employability.

This is evident in the second 21st Century Leaders report mentioned earlier. It is interesting to note from this report that business managers assess “managing information and digital technologies” as current graduate strength, with 83% stating that it is somewhat or very strong in Business and Management graduates. Interestingly the majority of students in the same survey consider that this skill is one in which they feel under supported by their Universities. This skill is not exactly the same as data literacy, but it is the closest match from within this study. The difference between the two stakeholder groups is striking. It is also interesting that employers do not consider any sort of digital skill in their top five skills and behaviours wanted from 21st Century Leaders.

This top five is identified as:

- Taking Responsibility (60%)
- People management skills (55%)
- Honest & ethical (55%)

- Problem solving & critical analysis (52%)
- Collaboration & team-working (48%) (Chartered Association of Business Schools, 2018)

The only one of these skills which could possibly have a relationship with data literacy is “Problem solving & critical analysis”, but there is no mention of anything to do with data.

This disparity of opinion between business managers and undergraduates regarding digital skills and information management provide evidence for some of the problems that I will identify throughout this thesis, these being:

- The concept of data literacy is poorly understood by business – business managers assume that graduates will have good digital skills because of the generation to which they belong. Data literacy skills are not considered as part of this skill set and not actually considered at all.
- Students feel that they are under supported in the use of business-related digital skills (of which data literacy is one of the most important).
- Data literacy skills are not considered to be an essential part of the employability skillset of Business and Management Students, despite these skills being so vital to business.

I will return to these issues throughout this thesis and will address them in my primary research.

1.5 Research question and objectives

The rationale for this study described above, leads to a contribution to Business and Management educational practice in HE by exploration of the following questions:

“*Data Literacy Skills – why are they so important for graduates? What can Business Schools do to improve the current situation?”.*

In line with this question the following research objectives (ROs) were developed from identified gaps in existing knowledge, strengthened by engagement with relevant literature.

RO1: To fully explore the concept of data literacy in the context of the employability of Business and Management students.

RO2: To explore the views and opinions of employers, regarding the data literacy skills of graduates and how well these meet the requirements of their own organisations.

RO3: To explore student experiences, views and opinions on their own skills (or lack of such) in respect of this area.

RO4: To explore the views and opinions of Academic staff on student skills in this area.

RO5: To explore the views and opinions of both students and Academic staff as to the ways in which subjects which fit into the data literacy category are taught, in terms of both content and delivery.

RO6: To attempt a triangulation of the views and opinions of all three groups of stakeholders and to explore both common ground and differing perspectives between stakeholders.

RO7: To recommend ways in which Newcastle Business School can adapt existing curricula of data literacy subjects in order to align more closely with the requirements of employers and abilities of the students.

1.6 Towards a definition of Data Literacy

As a practitioner of many years standing in the fields of Information Technology and specifically data management, I feel I am in a unique position to examine these subjects in some depth within the context of business needs and applications. My experience of working as an independent consultant also means that I can examine these needs from the perspectives of a very wide range of organisations, from SMEs through to International Corporations in a variety of business and industry sectors. My professional experience coupled with my current academic role has led me to consider the skillset I plan to examine in both the context of skills required by business and also the ways in which those skills are taught in business schools. I have called these skills "*data literacy* and the purpose of this section is to explore and examine the definition of this term in more detail. I intend to address this from

two perspectives. I have chosen to begin with an examination of the Data, Information Knowledge and Wisdom pyramid which is one of the most widely recognised models used in Information and Knowledge Literature (Rowley, 2007). Data Information and Knowledge are terms which will be used throughout this thesis, and it is important to demonstrate what exactly is meant by each term as they are used in the context of this research. Further discussion on each of the terms will take place at various points in the thesis, which will be signposted here. I will then discuss the concept of data literacy in the context of its position within other related literacies, before undertaking a critique of some current work associated with data literacy in an attempt to identify research gaps.

1.6.1 Data, Information and Knowledge

Figure 1.1 DIKW Pyramid (van Meter, 2020, p70)

There are many representations of this pyramid available in literature and some criticisms. The purpose of this discussion is not to deconstruct the paradigm, but to examine its components in the context of this thesis. In terms of a definition "*A commonly held view, stated roughly, is that data are raw numbers and facts, information is processed and organized data, and knowledge is meaningful and authenticated information*" (Denizhan Kalkan, 2008 p391) fits with the way in which I would describe these components. More detailed definition can be credited to Ackoff, to whom the pyramid is widely attributed:

"Data are symbols which represent properties of objects, events and their environments. They are products of observation. Data, like metallic ores, are no value until they are processed into a useable (i.e. relevant) form).

Information is contained in descriptions, answers to questions which begin with such words as who, what, where, when and how many? Information systems generate, store, retrieve and process data.

Knowledge is know-how, for example how a system works. It is what makes possible the transformation of information into instructions." Adapted from (Ackoff, 1989).

It is important to note in the context of this thesis, that the fourth component of the pyramid (wisdom) will not be discussed. Within the pyramid, wisdom tends to refer to areas related to moral and ethical judgements, which are outside the scope of the work being carried out in this study.

To return to the subject of the thesis, the importance of data and information to business is a thread running throughout. Data and its transformation into information is discussed in 2.2.1 as part of the discussion of end-user computing. In 2.2.2.3, the point is made that the advent of Big Data has increased this importance. However, conclusions are drawn that the wealth of data now available is only useful when processed using analytics tools to convert it into information.

With regard to knowledge, the work being carried out here is particularly concerned with organisational knowledge as defined by Nonaka's paradigm of tacit and explicit knowledge. (Nonaka, 1995). This is a refinement of Ackoffs definition of knowledge as simple "know-how" and is extremely important in an understanding in data literacy. In 2.2.2.2 the relevance and importance of knowledge and knowledge work is discussed in the context of competitive advantage and business success. It is suggested that the jobs available to Business and Management graduates might classify them as "knowledge workers", but it is recognised that this definition is generally ill-defined and likely to be problematic. To return to the subject of the DIKW pyramid, it is critical that definition of Data. Information and Knowledge are expressed at the outset of the study, in this Introduction in order to clarify use of the terms in later sections of the thesis. Ackoff's pyramid serves as a very useful way of defining and classifying the technical dimensions of the terms Data, Information and Knowledge. Data literacy, in common with other related "literacies" allows us to explore the social dimension of the terms. It is concerned with the application of the

skills which allow the transformations between the different levels of the pyramid to take place.

1.6.2 Data literacy in the context of related "literacies"

As a result of my experience within the data management and analysis sector I have a range of views as to how data literacy might be defined, but a definition needs to be formally stated and developed, in this Introduction, so that it can be adequately examined. At this point it is also important to begin to identify the research gap which I believe exists, so that my study can be positioned within the general landscape of business skills, undergraduate education and employability.

Data literacy is something which is generally not referred as a "literacy" in itself. It is often mentioned in the context of Information Literacy or Digital Literacy. Within this Chapter, a notable exception to this is the Universities UK report referred to in 1.7.4, which does use the term explicitly (although not in the specific context of Business and Management students). This lack of consideration of data literacy as a "literacy" in its own right begins to suggest a research gap. In 1.3, I identified a lack of recognition of data literacy skills within the Digital skills sections of the 21st Century Leaders report and this is also evidenced within the UK Government Digital Skills Strategy and related reports discussed in 1.7, suggesting that data literacy skills are not considered to be closely embedded within the digital skillset.

Having considered this lack of association between digital literacy and data literacy, I would like to now briefly investigate the relationship between data literacy and information literacy. This is considered in 1.7.3 in the context of the SCONUL 7 pillars of Information Literacy, but this report is firmly rooted in Higher Education and employability. I would particularly like to discuss the work of Calzada Prado and Marzal, who make a convincing case for the inclusion of data literacy skills within the Information Literacy skillset. Although this work is particularly concerned with the library context, the point very clearly made by these authors is that data literacy and information literacy are complementary in what they term the "Information Society" (Calzada Prado & Marzal, 2013). Individuals need to be in possession of a set of data literacy competencies in order to a fully exploit the data which is available to them. These authors establish a comprehensive set of these competencies in the context of library education which are very useful when considering data literacy in a

more general context, for example that of Business and Management students as they prepare for employment. Details of these competencies are laid out in Table 1.1

Table 1.1 Core competencies and Contents for Data Literacy Instruction – adapted from (Calzada Prado & Marzal, 2013)

1. Understanding Data	1.1 What is data?
	1.2 Data in Society: a tool for knowledge and innovation
2. Finding and/or obtaining data	2.1 Data Sources
	2.2 Obtaining Data
3. Reading, interpreting and evaluating data	3.1 Reading and interpreting data
	3.2 Evaluating data
4. Managing data	4.1 Data and metadata collection and Management
5. Using Data	5.1 Data Handling
	5.2 Producing elements for data synthesis
	5.3 Ethical use of data

This framework of competencies provides a really good basis for a definition of the concept of data literacy. This thesis is concerned with data literacy skills as they can be taught to Business and Management undergraduates but positioning these skills within the above framework of competencies could prove really valuable as a focus for my primary research and recommendations.

1.7 Current reports and frameworks

At this point in my Introductory discussion, I would like to examine some of the various reports, strategies and frameworks which have, over the last five or so years, attempted to classify skills within this general area. The purpose of this examination is to assess to what level (if at all) these pieces of work consider the data literacy agenda, demonstrate gaps in this agenda and contribute to my overall definition of the term which I will take forward into the rest of the thesis.

This section will present a brief outline of some of these reports, leading to identification of the research gap between these pieces of work and the subject of this thesis. Further examination of a wider range of reports will be undertaken in Chapter 2 (Literature Review), with a view to further investigation and assessment of the research gap.

At this point it is important to reiterate that there are two major aspects of this research. The first one of these is concerned with the skillset required by business, which I feel is clear to me from my work experience, as stated above. The second aspect which also needs to be considered is how Business and Management graduates acquire these skills in preparation for employment. Both aspects will be considered in my analysis of these reports

1.7.1 UK Government Essential Digital Skills Framework

This Government publication sets out a framework consisting of 5 categories of essential digital skills for life and work, these being:

- communicating
- handling information and content
- transacting
- problem solving
- being safe and legal online (Gov.UK, 2018)

While handling information and content and problem solving could both have a connection with data, there is no explicit mention of data skills anywhere in this framework, either in the headline or the detail. We can conclude from this that data skills are either not part of a digital skillset or are not considered essential for either life or work.

Having said this, the framework is quite simplistic and aimed at a broad audience of citizens, so at this level the omission of data skills is possibly understandable I would argue that a basic understanding of data is essential even at this level. The skills identified appear to be those concerned with accessing the Internet and an understanding of how data is used would seem to underpin all of these skills. As the word “data” is not even mentioned the implication is that it is not relevant in any of these contexts.

The framework is one of the outputs of the UK Government Digital Strategy published in 2017 (see below) which is a much more detailed document which might have been expected to address the data skills agenda.

1.7.2 UK Government Digital Strategy

This policy document lists 7 priority areas and is aimed at both citizens and business as detailed in Table 1.2

Table 1.2 UK Digital Skills Strategy (2017)

1	Connectivity - building world-class digital infrastructure for the UK
2	Digital skills and inclusion - giving everyone access to the digital skills they need
3	The digital sectors - making the UK the best place to start and grow a digital business
4	The wider economy - helping every British business become a digital business
5	A safe and secure cyberspace - making the UK the safest place in the world to live and work online
6	Digital government - maintaining the UK government as a world leader in serving its citizens online
7	Data - unlocking the power of data in the UK economy and improving public confidence in its use

Examining these 7 areas, it can be argued that data issues might be applicable to some extent in all of them. In the context of my research, however, it likely that items of interest would probably lie within area 2 (Digital skills and inclusion) with the emphasis on skills, and also in area 7 (Data).

Further examination, however, does not support this theory. Within the Digital skills and inclusion section, there is understandably a concentration on skills associated with use of the Internet as part of the effort to enable citizens to participate in the digital world.

However, mention is made of business and industry in the section entitled “Digital skills for a digital economy”. In this section, the importance of digital skills is highlighted; “Individuals, businesses, government and other organisations must take

steps now to ensure that we have the skilled and capable workforce needed in an increasingly digital world" (Gov.UK, 2017). This statement implies that the strategy is concerned with equipping young people and learners in general with the skills necessary to work within the digital world, developing skills which are necessary and relevant to business and industry. In terms of this thesis, the statement above encapsulates both aspects of my research, these being the needs of business and the ways in which Business School graduates acquire skills which enable them to meet these needs. Given what I already know in this area, I would expect data skills to feature in some way in this part of the strategy.

This is absolutely not the case. The first part of the discussion "Digital skills embedded in education" is concerned purely with coding and "hard" computing skills at Primary and Secondary school level. The second section deals with Lifelong learning in the context of basic digital skills at a comparable level with adult literacy or numeracy (what would have once been called "basic computer skills"). The final component of the policy document deals with "Digital skills for Digital jobs" but this again is concerned largely with skills associated with computer science. At no point is there any mention of data skills in any form.

Area 7 in the policy document is concerned purely with the subject of data, and it might be expected that data literacy and skills might be mentioned at some point in this section. Indeed, an early statement in the document is "The UK is at the forefront of data innovation". Having stated this, most of the rest of this discussion is around access to data, data protection and the data economy. One action point states that the government will "work with business and education providers to strengthen data skills provision" but this is not followed through with any explanation.

It can be concluded from this policy document that data literacy is not considered to be part of the UK Government's Digital strategy. As stated earlier, data literacy is not the same thing as digital literacy, but the two are certainly connected and the omission of data literacy from the UK Government Digital Strategy demonstrates one of the significant research gaps that I intend to explore.

I have already discussed the relationship between information literacy and data literacy in 1.6.2. This referred to the relationship between the two literacies in the

Library education context. In recognition of the overall importance of this relationship I would now like to consider it with an examination of the SCONUL 7 pillars of Information Literacy model.

1.7.3 SCONUL 7 pillars of Information Literacy model

Information literacy is a concept which is generally used with reference to Library education and also to Higher Education in general. It is therefore useful to examine it in the context of the second aspect of my research (graduate skills and how they are acquired). A widely used model in the field of Information Literacy at the graduate level is the SCONUL 7 pillars of Information Literacy model (SCONUL, 2011 p3). This was developed in 1999, but was revised in 2011. This is a while ago, but the model was updated in 2015 and it is still considered to be an important and relevant framework amongst HE and Information professionals.

This model goes some way towards defining the attributes of an information literate individual at graduate level and has a certain amount of overlap with what I would consider to be a data literate graduate. The early model defines such a person as someone who:

"*will demonstrate an awareness of how they gather, use, manage, synthesise and create information and data in an ethical manner and will have the information skills to do so effectively*".(SCONUL, 2011 p3).

In 2011, the revision of the model recognised that the skills and competencies identified in the core model were very generic and that it would be beneficial to amend and improve the pillars as viewed through a series of "lenses" appropriate to a range of different user communities. Lenses were gradually added to the model and in 2015 the graduate employability lens was developed, including the development of an "employability toolkit". It is this which is obviously most pertinent to this thesis. In summary the graduate employability lens takes each Pillar of the model and lists what graduates should "*Understand…*" and then "*be able to*…". Many of the items listed bear a great deal of relevance to the work I am hoping to carry out. For example, under Pillar 1 the Identify Pillar, graduates should "*Understand that information / data serve as an important basis for organisational knowledge*". They should therefore also "*Be able to Recognise the nature and forms*

taken by information / data that are needed to help resolve business questions or problems, and more generally to help reach workplace objectives" (SCONUL, 2015 p1)

This work is again leading towards a definition of data literacy, but in this case, I would contend that it is concerned purely with the skills of *understanding* rather than using tools to manipulate and interpret data. There is no mention of the skills that need to be in place which allow graduates to manipulate data and use the results in the recognition and solution of business problems. In this, the SCONUL model demonstrates that rather like digital literacy, information literacy is connected to data literacy, but data literacy does not appear in the model in either an explicit or implicit manner. In 2016 SCONUL added another lens to the model, this being Digital Literacy. However, this lens is concerned with skills around high-level Internet use and has very little to do with data, so will not be considered here.

1.7.4 Making the most of data: data skills training in English Universities

I would now like to consider a piece of work which adds more detail to the debate about the definition and position of data literacy within both business and the skillset of the employable graduate. This is a Universities UK report "Making the most of data: data skills training in English Universities" published in 2015. This is an important contribution to the data literacy debate as it actually uses the phrase "data literacy" and identifies the skills necessary for graduates as:

"*Research design, data collection, data management, data analysis, modelling, interpretation and the presentation of research findings*" (Universities UK, 2015, p11)

This is very encouraging and leads towards a conclusion that perhaps there is some recognition as to the importance of data literacy as a concept.

The quote above is actually close to a definition which would integrate with the aims of this research and I intend to use it as a way to describe what I mean by data literacy when I conduct my primary research.

The report also appears to recognise the importance of data literacy in the modern workplace, making the point that "*As the use of data increases, a sufficient supply of data skills becomes critical in the UK's labour force*" (Universities UK, 2015, p1). It

also recognises (along with several other pieces of literature) that data management and analysis are not taught in a cohesive manner on many University courses. However, the report goes on to discuss data analysis training in STEM (Science, Technology, Engineering, and Mathematics) subjects and Social Sciences, with little mention of Business and Management degrees and the actual tools which might be useful to graduates of such degrees. The research gap here is therefore one of context. Universities UK recognises that data literacy is a necessary skill, but not in the context of Business and Management graduates or the applications of data within the business context.

1.7.5 Skills for Jobs: Lifelong Learning for Opportunity and Growth

This White Paper was published in January 2021 by the UK Government and would appear to be very relevant to the work that I am carrying out in this research. It underpins a Lifetime Skills Guarantee which has five main aims. The one which has most relevance to this study is "*Putting employers at the heart of the system so that education and training leads to jobs that can improve productivity and fill skills gaps*" (UK Department for Education, 2021 p5).

This White Paper is written in the context of the FE and apprenticeship sector, but it is encouraging that skills for jobs are being put centre-stage, particularly with a focus on working with employers to identify skill gaps.

I would have really hoped to see some mention of data skills in this report, given that it is so recent. However, in common with the Digital Strategy mentioned in 1.7.2 above there is no mention of the importance of data skills. One aspect of the Lifetime Skills Guarantee is English, Maths and Digital Skills for everyone (UK Department for Education, 2021 p5), citing a statistic that 52% of the workforce do not have essential digital skills for work. This statistic is quoted from the Lloyds Bank Consumer Digital Index (LLoyds Bank, 2020) . Further examination of this Index in an attempt to find a definition for "essential digital skills" is disappointing. Most of the essential digital skills identified, even in the work environment, are concentrated around communicating and transacting online. One element of digital skills out of 13 is related to data literacy and this is "*I can use appropriate software, including a spreadsheet, to manipulate and analyse data*" (LLoyds Bank, 2020). This is a fairly

basic description of a basic skill. Even so only 57% of the working population are assessed as being able to do this in 2019, dropping to 56% in 2020.

As this White Paper is so recent, I would have expected that strategies to address data literacy in some form would have been included. The fact that they are not, points to a real gap in the UK Government's approach to the subject.

1.7.6 Learning and Work Institute: Disconnected; Exploring the Digital Skills Gap

This report is even more recent than the Skills for Jobs White Paper described above, having been published on 22nd March 2021. This report is funded by the UK Government Department for Education.

The report presents data collected from a range of sources which examines the importance of digital skills to business from the perspectives of employers, young people and education. Research into the importance and relevance of digital skills to business was carried out via a YouGov survey of HR decision-makers in 1,004 businesses from across Great Britain. Highlighted results of this survey include:

"*92% of businesses say that having a basic level of digital skills is important for employees"*

"76% of businesses say that a lack of digital skills would affect the profitability of their business" (Learning and Work Institute, 2021, p8)

A digital skills gap is identified here. 23% of respondents to this survey say that they face skills gaps with regard to digital literacy and 37% say they face gaps with regard to advanced digital literacy (Learning and Work Institute, 2021)

2017 young people (16-24) also contributed to a survey carried out by Youthsight. Results from this survey showed that 62% of respondents were very confident that they had the basic digital skills required by employers, but only 18% were very confident that they had the required advanced digital skills (Learning and Work Institute, 2021), further pointing to a skills gap in this area. Educational data supports this with decline in young people choosing ICT subjects at GCSE, A' Level and in Further Education since 2015 (Learning and Work Institute). (Learning and Work Institute, 2021)

From the perspective of this thesis, this report is very interesting. In common with all the other reports examined in this chapter (apart from the Universities UK report, which has different limitations), there is no mention at all of data skills as part of the digital skillset. The only definitions of digital skills in the report can be found as a footnote on page 8, these being:

[1] *By basic digital skills, we mean a proficiency with common software such as Microsoft Word, Excel, PowerPoint; ability to process digital information and content; ability to communicate digitally; and the ability to learn new digital skills etc.*

[2] *By 'advanced digital skills' we mean a good knowledge across a range of digital skills, as well as in-depth specialist knowledge in one or more area, such as computer aided design, coding, specialist digital software"* (Learning and Work Institute, 2021, p8)

To a certain extent, this report follows on from two of the previous reports discussed in this chapter, these being the UK Government Digital Skills Strategy and the Skills for Jobs White Paper, both of which fail to address the issue of data literacy. When considering digital skills in business, I believe that data literacy skills are one of the most important parts of this skillset and I would argue that higher level data literacy skills should be considered as advanced skills, given the importance of data to business in the modern world. Research carried out in this thesis will help to advance this argument.

For ease of reference, Table 1.3 sets out the work which has been described above, demonstrating the research gaps in each report or model, where the issue of data literacy is not addressed, or is not addressed in the context of the business world or Business and Management graduates.

Table 1.3 Research gaps identified

Report or Model	Relevant theme under consideration	Research Gap
UK Government Essential Digital Skills Framework (2017)	Essential digital skills for life and work.	Aimed at a broad audience, but no mention of data skills with regard to life or work. Work is obviously more relevant to this study.
UK Government Digital Strategy (2017)	Digital skills and inclusion	Addresses the issue of digital skills in the areas of coding at Primary and Secondary level, basic digital skills for adults and computer science education. Again, no mention of data skills at all.
	Data	Largely concerned with access to data, data protection and the data economy. Reference made to provision of data skills, but this is not followed through.
SCONUL 7 pillars of Information Literacy model (2015)	Information skills, particularly through a graduate employability lens.	Emphasis on understanding of data concepts but does not consider the use of any tools or techniques to manipulate data and use results.
Making the most of data:data skills training in English Universities (2014)	Data literacy skills in Higher Education	Concentrates on data analysis training in STEM (science, technology, engineering, and mathematics) subjects and social sciences. Little mention of Business and Management graduates.
Skills for Jobs: Lifelong Learning for Opportunity and Growth (2021)	"Putting employers at the heart of the system so that education and training leads to jobs that can improve productivity and fill skills gaps"	Aimed initially at the FE and apprenticeship sector. Does not address data literacy as a skill, but instead concentrates on digital literacy, which is largely concerned with communicating and transacting on the Internet.
Learning and Work Institute: Disconnected; Exploring the Digital Skills Gap	The report presents data collected from a range of sources which examines the importance of digital skills to business from the perspectives of employers, young people and education, demonstrating a skills gap	Does not define data literacy as part of the digital skillset at either a basic or advanced level.

1.8 Working definition

In section 1.6 an attempt was made to construct a definition of the concept of data literacy by addressing definitions of Data, Information and Knowledge. This was followed by an examination of the concept of data literacy in the context of other related “literacies”, particularly digital literacy and information literacy. Calzada Prado and Marzal’s very useful Core Competencies and Contents for Data Literacy Instruction framework was introduced as a possible basis for the definition of data literacy in the context of this thesis.

Section 1.7 concentrated on a recognition of identifiable gaps in current approaches to the subject of data literacy from both UK Government and Higher Education. As part of this examination of research gaps, another set of definitions of data literacy was discovered as part of the Universities UK report “Making the most of Data”. These definitions map convincingly onto the Calzada Prado and Marzal Competencies framework but are more concerned with data skills rather than the broader competencies approach. Table 1.4 demonstrates how the two sets of definitions might be compared.

Table 1.4 Calzada Prado and Marzal and Universities UK. Definitions of data literacy compared

Prado and Marzal	**Universities UK**
Finding and/or obtaining data	Data collection
Reading, interpreting and evaluating data	Interpretation and the presentation of research findings
Managing Data	Data management
Using data	Data analysis, modelling,

Considering the two approaches in the context of a working definition of the concept of data literacy, the definitions are very close. A significant difference in definition between the two works is that Prado and Marzal consider “Understanding Data” to be an important element, whereas Universities UK identify “Research Design” as one of the major components of their definition. This can be explained by the Library and

Information Science context of the Prado and Marzal work, with Research design understandably being considered as more vital within the Higher Education definition. Having noted this difference between the two works, some of the detail of the Calzada Prado and Marzal approach could certainly be used to add depth to the Universities UK definition. It could also be argued that the Calzada Prado and Marzal approach is not quite fitting to the subject of this thesis, given its Library education roots. It could also be argued that the Universities UK definitions contain too much of an academic focus (concentration on research). In that sense, neither set of definitions are a complete fit with the subject of this thesis. I am attempting a definition of data literacy in a Business context, rather than a Library or Higher Education context. However, the Universities UK definitions are positioned around data skills rather than competencies and it is data skills which are under examination in this thesis. The University UK definitions, particularly data analysis and modelling appear to be more associated with actual skills taught to Business and Management students and are also skills which are recognisable to a business audience. To this end, I will use the Universities UK definition as my working definition in this research, being mindful of the Calzada Prado and Marzal set of competencies as very useful background depth.

1.9 Focus of study

The previous sections review and present a rationale demonstrating that it is a useful exercise to examine the current situation with regard to the teaching of data literacy on Business and Management degrees, with a view to developing skills which can enhance graduate employability. In order to conduct a comprehensive study, it is recognised that such an exercise involves a multiplicity of stakeholders, and the study will focus on three specific and arguably the most important groups of these. First of all, there are the students themselves. They come to University with a range of qualifications and experience in the area under discussion. Some may have Higher Qualifications in Maths, ICT or Business and may have an interest in, and competency with analysing data using software tools. Some may not have studied any of these subjects beyond GCSE Maths. As such they will have a wide range of expectations, opinions and competencies in the data literacy area. Anecdotally, amongst staff teaching data analysis, it appears that students are often

apprehensive of using software tools such as spreadsheets and databases and this can hamper their progress.

Obviously, students develop skills during their time at University and it may be that their perception and ability with software tools changes during their Undergraduate journey. Business and Management students also often go out on Work Placement and it may be that doing so also changes their view and level of skill in this area. It is widely recognised that work placements (particularly whole year placements) provide a range of benefits to undergraduates and are positively linked to employability.

Brooks and Youngson point to evidence that undergraduate placements have a positive effect on final degree classifications as well as on the attainment of graduate level employment (Brooks & Youngson, 2016)

Achenrainer et al. comment that graduates who have been on placement while in Higher Education are more than twice as likely to obtain a job on graduation. They also point towards an increase in self-efficacy amongst these graduates, self-efficacy being identified as one's judgements or expectations about one's own capabilities (Achenreiner et al., 2019).

In the context of this study, it would be interesting to explore the specific area of data literacy, examining whether or not undertaking a placement enhances skills in this area, again looking explicitly at Business and Management students on their return from placement.

The second group with an involvement and interest in this issue are the graduate employers and Work Placement providers. In terms of data literacy, employers have specific requirements of their employees and it would be useful to explore the exact nature of these requirements, in the context of graduate recruitment.

In terms of this thesis, it will be necessary to evaluate the data literacy skills identified as important by employers of Business and Management graduates in a range of settings. It will also be useful to attempt to ascertain how well this corresponds with the skills identified by the graduates themselves and also by academic staff within the University arena.

This brings us to the third set of stakeholders within the overall framework under discussion, this being academic staff within the University.

For the purposes of this study, input will be sought from academics who have a direct involvement with teaching subjects related to data literacy in the Business School context. Such staff will generally have experience of designing content and delivering lectures, seminars and workshops on modules related to data analysis tools, generally spreadsheets and databases.

These three groups of stakeholders form the main focus of the study. At this point it is also worth stating that the study will concentrate on students, University staff and employers within the North-East region of England. This is the area in which I have worked extensively both in Business and in Education and the area in which I feel I can make the most valuable contribution.

1.10 Approach to Study Design

I will be taking a Qualitative approach to study design and to data collection and analysis. Given the diverse nature of the stakeholder groups described in 1.9, I plan to conduct a set of in-depth interviews with participants representing each group pf the three identified key stakeholders. Given the nature of the stakeholder groups, this will allow me to construct a detailed understanding of the complex landscape of Business and Management undergraduate employability in the context of data literacy, through interview data collected from each of these groups. Data will be collected via a set of in-depth interviews. Easterby-Smith describes this form of data as being natural language data, collecting data in this way is to discover the views, perceptions and opinions from both individuals and groups, through language (Easterby-Smith, 2012). This method of data collection will allow me to investigate the experience, views and opinions of all stakeholders in an appropriate level of depth.

In terms of the students, I aim to conduct Interviews with individual participants at Study Level 4 and Level 6. Level 4 students will be selected once they have completed the BM9400 Business Analysis for Decision-Making module. Some Level 6 students will have completed a work placement and others will not. I have decided not to interview Level 5 students as modules with data literacy content are not

offered at Level 5. It would have been useful to adopt a longitudinal approach, following a discrete group of students through the undergraduate process, but time constraints make this impossible.

Students will be recruited via an email invitation sent to all members of the Business and Management population and will therefore self-select.

A large number of employers will be contacted via email, with a view to recruiting a meaningful participant group. In line with the focus of this study, such employers will be approached in the North-East region. DHLE statistics show that Business and Management graduates tend to be employed by all sizes and many types of organisation, and this will also be reflected in the invitations to participate. Appropriate organisations will be recruited via the University of Northumbria Business School Placement database, plus personal professional contacts of my own.

Academic staff and other interested parties will be recruited from the Business School and selected by subject specialism and/or interest and expertise in the area of employability.

It is envisaged that data analysis will be carried out using a triangulation method. This study will use data triangulation where data is collected from different groups and different times (Easterby-Smith, 2012). Carter et al. comment that this approach can broaden the understanding of the phenomenon of interest (Carter et al., 2014, p1). I am certain that this is true with regard to my stakeholder groups as they are approaching the issue from a range of different standpoints.

1.11 Chapter Summary

This thesis is organised into six chapters.

This first Chapter has outlined the rationale and focus of the study, providing definitions and pointers towards the overall structure of the research as well as identifying gaps in existing research and the potential contribution to practice.

It has also outlined my Research Question and Research Objectives, my own personal motivation for undertaking the research and the potential contribution of the study.

Chapter 2 critically reviews existing literature in the areas of data skills and graduate employability to:

1. Review the importance of data literacy in the workplace and demonstrate how this importance has grown over the last 40 years.
2. Examine how existing graduate employability frameworks map onto the area of data literacy.
3. Examine how data literacy subjects are taught in University Business Schools and how they might map onto 1. and 2.

Chapter 3 undertakes an analysis of a range of standards in the higher education and business education sectors examining how well these standards address the issue of data literacy. This leads to the identification of key issues, based on the standards which need to be addressed in the context of the teaching of data literacy subjects. This chapter continues with an institutional analysis of data literacy subjects identified at a range of UK Business Schools against the key issues identified in earlier in the chapter.

Chapter 4 identifies the epistemological and philosophical underpinnings of the research, before a detailed discussion of the methods chosen for data collection and analysis. Justification will be given for the choice of a qualitative approach to the data analysis.

This chapter will also justify my position academically and professionally. It will also contain justification for the methods of selection of participants and data analysis and of methods of dealing with ethical issues associated with the research.

Chapter 5, presents findings from the qualitative research. Emergent themes will be synthesised with themes identified in extant literature and structured around the key themes that have emerged from the Literature Review and the data analysis. Key finding will be introduced which will form the basis for key themes identified in Chapter 6.

Chapter 6 is the final chapter. In this chapter conclusions from the Research are aligned with literature and the Research Objectives outlined in section 1.5 of this Chapter.

This is followed by recommendations to practice based on the conclusions outlined in Chapter 5, including a case study of a new Level 3 module which has been developed around the recommendations made.

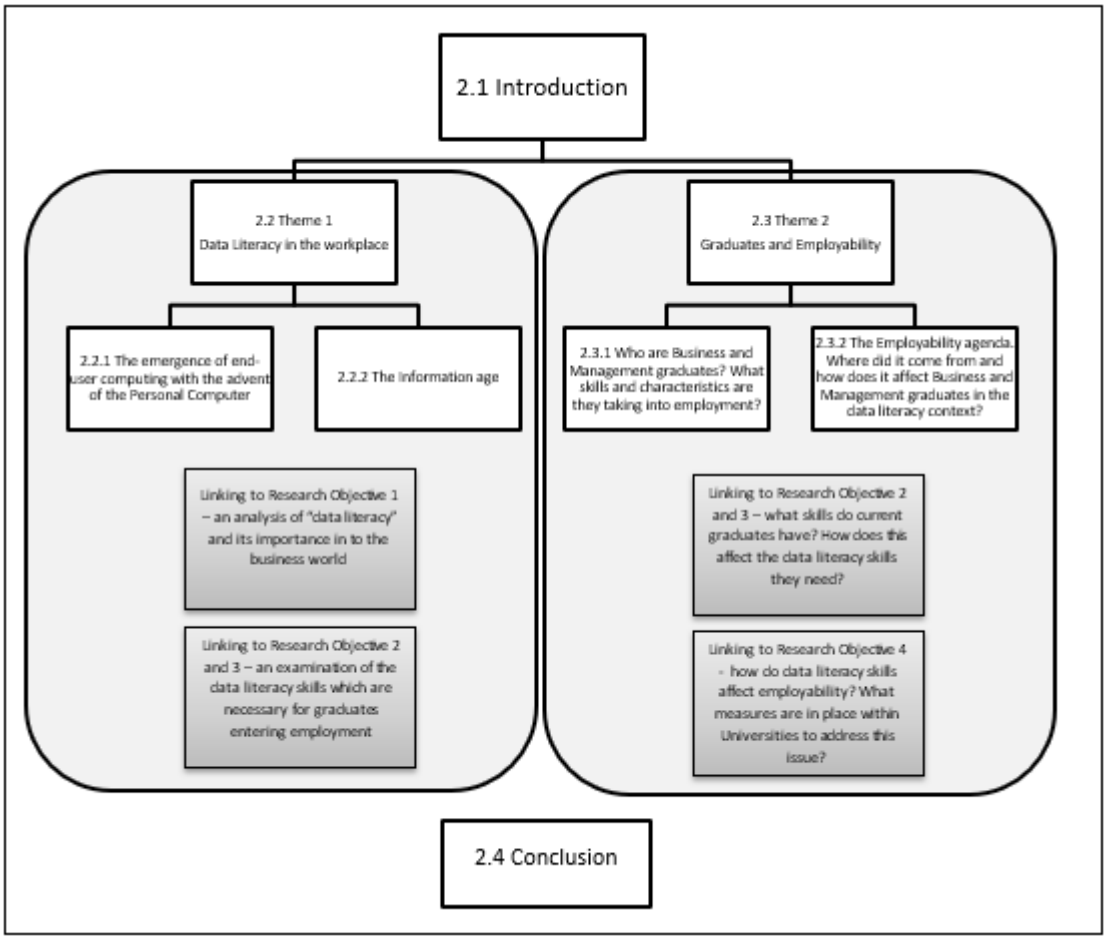
The final part of this chapter concludes the thesis discussion around contributions to knowledge, contributions to practice, considerations for further research and a reflection on my own development as a researcher, throughout the DBA process.

Chapter 2 - Literature Review

2.1 Introduction

Figure 2.1 is a graphical representation of the structure of this literature review. As can be seen, two aspects of literature will be examined, the first one being an exploration of the concept of data literacy itself. The second aspect relates to graduates, their particular characteristics and the extent to which the focus on employability in Higher Education addresses their data literacy skills as they enter employment.

Figure 2.1 Structure of Literature Review



The use of data management in the workplace is not a new phenomenon. Electronic management of data has been a feature of business operations since the development of computing systems in the 1950s and 1960s. The arrival of the personal computer and associated business software in the 1980s saw a shift in data management activities. Such activities were no longer carried out purely in the

domain of computing professions as tools such as spreadsheets were made available to staff in other business departments. This shift in activities is underpinned by a recognition of the definitions of data, information and knowledge expressed in Ackoff's pyramid discussed in 1.6.1. Staff in business departments were using personal computers to process data to generate information which was useful to themselves and their departments. To a certain limited extent, they were creating organisational knowledge.

In all business areas, skills associated with management and interpretation of data were becoming vital to business employees of all types. The results of this management and interpretation in the creation of information and knowledge were also vital to businesses themselves. This has continued to be the case.

According to the results of research carried out in 2016 by the UK software company Alteryx into the use of data and analytics in European business:

"*It's clear that data and analytics are transforming the way businesses operate around the globe*" (Alteryx, 2016, p9)

This survey was based on responses from a total of 500 business respondents from a wide variety of industry sectors. 75% of respondents were senior managers or directors and 25% were other staff grades.

Given the fact that the respondents to this survey were overwhelmingly appreciative of the use of data analytics tools to improve their business performance, it is not surprising that 75% of them said that they would consider proficiency in and working with and analysing data to be essential or very important when hiring new staff. Interestingly, 30% of respondents considered these skills to be the most important in respect of new staff, just behind industry experience at 33%.

In the same year the Harvard Business Review conducted another survey on Data Analytics called The Untapped Power of Self-Service Data Analytics. This survey involved more than 600 business and IT leaders in fifteen industries and concluded that:

"*More than 60 percent of respondents say they already use some form of data analytics tools to generate insights that contribute to their business decisions. More*

than 80 percent expect their data analytics tools to be extremely important to them in the next two years" (Harvard Business Review, 2016, p3).

In 2020 Business2Community surveyed 500 global analytics and business intelligence professional on their 2020 Global State of Enterprise Analytics report. Their number 1 statistic was that

"*94% of business professionals say data and analytics is important to their business growth and digital transformation, up 4% from 2019*" (Business2Community, 2020, p1).

Examination of the idea of data literacy in the workplace, using data from surveys such as the ones described above, strongly suggests that activities associated with data management are considered to be of critical importance to business leaders. Business and Management graduates are being prepared (and preparing themselves) to become such employees. One of the key objectives of the primary research in this thesis is to examine their data literacy skills in depth, investigating how these skills align with the needs of business. This will be carried out with reference to the definition of data literacy put forward by Universities UK and recognition of the Calzada Prado and Marzal set of competencies, both outlined in Chapter 1. If, as currently believed, skills need to be improved, recommendations will be made specifying how a university Business School can work to help students improve and develop in this area.

Working towards these recommendations, 3.2 will investigate how the issue of graduate data literacy skills is currently being addressed in both a sectoral and institutional context. This will be done by first carrying out an analysis of several educational standards and frameworks which are applicable to Business Schools and Business and Management degrees in particular. This will be followed by a critical analysis at institutional level to determine how a selection of Business Schools approach data literacy education in the context of the frameworks and standards examined and also in the context of the analysis of the results gathered in the course of my own primary research.

2.1.1 Structure of Literature Review

In order to begin to investigate the above, some important issues need to be addressed. The aim of this Literature Review is to address these issues and provide a pathway towards the original research to be carried out in the thesis.

Section 2.2 will examine how end-user computing became embedded within business organisations in the latter decades of the 20th Century, considering how the tools developed during that time have evolved and the ways in which modern end-users are now concerned with the manipulation of data, given that many of their concerns are likely to be the same. Terms such as the "Information Age" and "Knowledge workers" will be examined in the context of business employees.

In Section 2.3 an examination will be carried out of the characteristics of undergraduate Business and Management students in the context of the generation to which they belong. The aim of this section will be to determine if there is anything in particular about these young people which affects their development of business-related data literacy skills.

The generation to which current undergraduates and recent graduates belong is often referred to as Generation Z, defined by Mintel thus:

"*Born between 1980 and 2000 Generation Z is characterised by having grown up with near-constant access to technology and a wealth of digital services in their everyday life were the first generation to grow up without knowledge of a world without these technologies*" (Mintel Group, 2018)

They are also sometimes described as Digital Natives, defined by Prensky as the first generation of people to have been born within the age of readily available digital technology (Prensky, 2001). In theory then, the life experience of our current undergraduates up to now should make it easy for them to develop skills in digital areas, including data literacy.

Following on from this examination of undergraduates and their specific generational characteristics, this Literature Review will then undertake an examination of the

reality of the situation with specific regard to data literacy. It is true that the generation of students and graduates under consideration are confident with a range of digital tools and applications. Having said this, it is important to examine if this confidence really does translate into the data literacy arena. There is a school of thought that the relationships between the two variables (being a digital native and also being confident with business applications which analyse and manage data) is not straightforward or linear. Examination of this relationship will also serve to inform some of the original research being undertaken here, as it will enable me to gain an understanding of the likely challenges around the application and demonstration of data literacy skills for both graduates and employers in this context, when the graduates enter employment. It will also provide information which could help to inform University Business Schools with regard to data literacy aspects of the curriculum.

The final consideration with regard to the graduates in question will be an examination of relevant work regarding data literacy and employability, carried out in 2.4. In terms of employability there are a profusion of resources available in the form of frameworks and strategies which aim to address the issue of enhancing the employability skills of graduates. These have already been introduced in Chapter 1. Undoubtedly such resources are very useful and provide a wealth of detail which is very helpful to students and educators. However, it is my contention that they do not necessarily discuss the application of data literacy skills and certainly do not do so in the context of Business and Management graduates.

These models will be examined and critiqued in some detail in an attempt to identify the “gap” between the skills and attributes they express and the data literacy skills required by employers of Business and Management graduates. As mentioned in Chapter 1, a useful illustration of this gap can be found in the Universities UK report “Making the most of data: Data skills training in English universities”. This report recognises that data skills are both necessary in most types of employment and are often not sufficiently considered in the UK Higher Education curriculum. However, while recognising that data literacy skills are vital in many different types of employment, this report concentrates very much on the development of skills to enable students to pursue careers as data analysts, rather than developing skills in

data analysis to enhance performance in business-related jobs. It also mentions "*boosting the business and soft skills of graduates from data analytics courses*" (Universities UK, 2015, p8). In the context of this thesis, it is the converse of this, the data analytics skills of business graduates which are under examination. In the various graduate employability frameworks which have been developed, this gap is also evident. The frameworks will be examined more closely in the main body of this literature review, but it is sufficient to say for now that they are concerned to a large extent with "soft skills" such as self-confidence, teamworking, entrepreneurial thinking etc. Data Literacy is not considered explicitly as a skill or attribute.

2.2 Data Literacy in the Workplace

2.2.1 The emergence of end-user computing

This section will start with an examination of the use of data management in business, specifically with regard to the development of what I will describe as “end-user computing”. An historical perspective will be taken initially. This is important as it provides a context which describes how the use of computer systems, data management and analysis came to be part of so many jobs in business. To this end, literature has been examined which was published at the time. Literature from the 1980s and 90s provides a valuable insight into the computing landscape as computing began to move from the era of data processing to the era of information technology (Earl, 1989).

This movement between “eras” of computing and the development of user involvement in computing as the information technology era began was brought about by the invention of the Personal Computer in the mid-1980s. When the phenomenon first emerged, it was often described as “end-user” computing. This concept is examined in detail in 2.2.1 of this chapter, but it is useful to attempt definition of the term here, from the time when the subject of end-user computing was being widely discussed within the relatively new field of Management Information. In terms of this literature review, a broadly chronological approach will be taken, in line with the developments under discussion.

McLean and Kappelman conducted a study asking 74 IT executives of the Grocery Manufacturers of America to identify activities which could be classified as being part of end-user computing. From this they constructed a definition of the concept, that end-user computing is computing which is outside the direct control of the Information systems department (McLean & Kappelman, 1992).

As part of the study respondents were invited to rank activities which they defined as being end-user activities. Figure 2.2 shows the levels of agreement on these activities between respondents, with for example 100% of respondents considering use of spreadsheets to be an activity which could be defined as end-user computing:

Figure 2.2 End-User Computing Defined by Activities

Table 2 End-User Computing Defined by Activities

Rank	Description of activity or application	Percent reporting
1	Use of spreadsheets	100
2	Management graphics	95
3	Word processing	93
4	Queries and report generation	85
5	Desktop publishing	78
6	Electronic mail	77
7	Decision support systems (DSS)	73
8	Local area networks	68
9	Creating local databases	68
10	Using external databases	66
11	Calendaring meeting management personal support	61
12	Executive information systems (EIS)	57
13	Voice mail	49
14	Facsimile	46
15	Computer-aided design and manufacturing (CAD/CAM)	37
16	Electronic data interchange (EDI)	31
17	Local accounting system	30
18	Systems analysis and design	24
19	Processing transactions for local organization	24
20	Expert systems/artificial intelligence (ES/AI)	23
21	Prototyping	23
22	Computer-aided instruction and training (CAI)	23
23	Maintaining part of the corporate database	18
24	Process control	18
25	Developing applications for corporatewide use	16
26	Computer-aided software engineering (CASE)	14
27	Computer integrated manufacturing (CIM)	3

(McLean and Kappelman, 1992 p.149)

This table is very interesting as it points to great deal of similarity between end-user activities at this time and the activities currently carried out by those who could be defined as modern end-users. The software has become more sophisticated, but spreadsheets are still considered to be vital, as are all of the other activities, probably as far down as number 13 on the list, with only the use of fax machines having been rendered obsolete.

A study of the emergence of end-user computing, using the literature of the day is therefore considered to be a very useful starting point to this research. The Business and Management graduates under examination in this thesis are entering a world where they are expected to use computer software as part of their jobs. Understanding the background to these expectations and how the business landscape changed with the advent of end-user computing can help with the understanding of the challenges faced by current graduates. It is also useful to identify the problems faced during the rise in significance of end-user computing to see what can be learned from this period which can possibly be applied to the preparation of graduates as they enter the current business world and engage with the management and analysis of business data as an important part of their jobs.

Literature examined in this section supports the fact that since the advent of the Personal Computer in the early to mid-1980s the use of computers for the management of data and information in business has been transformed. As personal computers have proliferated within a range of traditional business functional departments, staff have been required to change the ways in which they work. With the development of networks and the increasing power of desktop computers and their applications, it has been necessary for the skills required by a wide range of staff to develop even further. In the words of Peng, "*With the penetration of information technology into every walk of business, computer skills become increasingly valued in today's workplaces*"(Peng, 2017, p1) . This author goes on to say that "*examining the impact of computer skills on employment is of great theoretical and practical importance*" (Peng 2017, p2). This began to be true in the 1980s and continues to be true today.

The development of what was in the 1980s called "end-user computing" began to take tasks which had previously been carried out by centralised data processing departments into the hands of departmental employees and such employees needed to have or develop skills in performing these tasks.

There are several definitions regarding end-user computing and its position as computing that happened outside the direct control of IS departments. Regan refines this definition in later times, bringing in the idea of decision support systems and the importance of relevant data to functional departments. This author focuses on the fact that end-user computing primarily supported local business functions in the building of decision support systems. End-users relied on the IS department to deliver data to enable the building of these systems (Regan, 2002)

The main observations to be made about end-user systems in the 1980s and 1990s was that they were more business-focussed and closely aligned with decision-making and business strategy than the more basic procedural systems developed and controlled by data processing departments at that time. For example, in the early days of business computing, centralised (normally mainframe-based) systems were used to automate activities such as payroll and sales order processing. End-user applications, built on software such as spreadsheets and databases were able to carry out tasks such as staff performance management and sales predictions, both

of which could be used as an aid to strategic decision-making. These systems were often referred to as Decision Support systems. Valacich defines such systems as tools which are mainly used by departmental managers, but which can be applied at any level of a business function to help use data to solve semi-structured problems (Valacich, 2016). Such systems are still very much part of the business landscape and are often a critical part of business strategy development. The central aspect of this, in the context of this thesis is that fact that it is not computing professionals who use such systems but rather a range of end-users in business departments. The Business and Management graduates under consideration here are almost certainly going to become those types of users when they enter employment.

At this point it is useful to attempt a definition of the identity of the end-user, as separate to the whole phenomenon of *end-user computing* as these people would have been described at the time. Rockart and Flannery provide such a definition by considering the types of tasks that end users need to perform, coupled with their level of expertise, dividing end-users into six “classes”. These authors arrived at their definitions by carrying out a study in which they carried out interviews with 200 end-users and 50 members of end-user support staff from information systems departments in 54 different companies.

These definitions are laid out in Table 2.1, with narrative provided by myself to describe typical tasks carried out by each class of user:

Table 2.1 Classes of end-user

End User Class	Description of typical tasks
Nonprogramming end-user	Accessing computer-stored data through software provided by others
Command-level end-user	Performing simple enquiries and/or calculations and generating simple reports for their own use. Know just enough about the software to aid them in their jobs in functional departments such as personnel or accounting
End-user programmers	Develop their own applications using tools such as spreadsheets for their own “personal” needs in departments such as finance and planning
Functional support personnel	Sophisticated programmers supporting other end-users within their own functional areas. These people did not normally consider themselves primarily as data processing professionals but as people who could develop and use tools to aid data analysis within this functional area
End-user computing support personnel	Offering “help-desk” and general advice in an Information Centre or other central support department
Data Processing programmers	Developing and amending programs written in end-user languages. Such staff were not generally employed in end-user departments, but often in central “pools”

adapted by author from (Rockart & Flannery, 1983, p3)

From this research, the end-user classes containing the most staff were seen to be End-user programmers (21%) and Functional support personnel (38%).

As well as the classification of end-user types, the main point to note from this study is the diversity of the end-user population. Not all end-users fall into one of the defined categories and several fall into more than one. It is also important to reiterate that these end-users were using computers as part of their original jobs – accountants were using their PCs and software to aid with the accountancy function, personnel managers were using them to help them to manipulate staff data, production staff were using them to monitor the efficiency of machinery etc. It is likely that even end-users at the lower end of the proficiency scale began to understand

the advantages that computers and associated software could bring to their functional areas.

We can summarise 2.2.1 on the definitions of the activity of end-user computing and the identify to the end-user population by saying that the emergence of end-user computing demonstrated a great shift in job roles and focus for many employees in a range of functional departments. Bergeron et al believe End-user computing to be a tremendous change in organisational practice, as important in the 1980s as the first implementation of computers was in the 1970s (Bergeron et al., 1990)

2.2.1.1 End-user computing from an organisational perspective

Having explored the definitions outlined above, it is now useful to examine end-user computing from an organisational perspective and the individuals and departments who were involved in the changing landscape.

At this point, it is worth considering how much importance organisational decision-makers assigned to end-user computing as a key issue within the Information systems environment during the 1980s. MIS Quarterly provides some interesting and useful statistics. In 1982 the publication carried issued a questionnaire to members The MIS Quarterly report “Key Information Systems Issues for the 1980’s”, from September 1984 provides a good starting point. This report begins by exploring the issue of the complexity of the business information systems landscape at that time and comes to the conclusion that an identification of key issues is necessary (Dickson et al., 1984). The authors carried out a Delphi study with 54 Information Systems professionals from a range of industries. The first questionnaire administered related to the identification of 10 key issues, whilst the second questionnaire performed a ranking exercise on the key issues defined.

The three issues identified were:

1. Improved Information systems planning
2. Facilitation and management of end-user computing
3. Integration of data, processing, office automation and telecommunications

In the first questionnaire, the first two issues were identified as key by all respondents (Dickson et al., 1984, p137)

It is evident that by the mid-1980s, end-user computing was being taken seriously by business. Earl describes the advent of end-user computing as the movement between two distinct “eras” of computing – from the DP (Data Processing) era towards the IT (Information Technology) era. There is a plethora of definitions for computer-based activities. Information Systems and Information Technology are two of the most common which are often used interchangeably in the literature. In the context of IT eras Earl defines IT in technical terms as comprising computing, telecommunications and automation technologies. He also defines IT activity as the supply, development and use activities in which an organisation needs to be involved in order to exploit these technologies (Earl, 1989).

Gerrity and Rockart also define the growth of end-user computing through the lens of developing eras. They refer to the First Era (accounting and clerical applications) and the Second Era (direct operational support to such activities as manufacturing and order processing) where information technology supported functional business activities. Their Third Era is the Information Era, where technology is used to support staff and managerial needs, focusing on information, problem-solving and communication (Gerrity and Rockart, 1986, p25)

The key point to be made here is that with the advent of end-user computing, information technology tools were increasingly in the hands of individuals working in business departments (end-users as defined above) and no longer under the ultimate control of departments dedicated to computing. More sophisticated applications were made available to such users, enabling them to create and manipulate their own documents, spreadsheets etc., initially in a standalone environment. As networking technologies became more common and applications became more sophisticated, the end users became even more involved in what had previously been the domain of the Data Processing department. Regan defines these applications as fourth-generation software tools. They were more graphically based, easier to use and did not require the need for technical skills or programming. (Regan, 2002). They were also flexible enough to meet a large range of diverse business needs.

As the power and flexibility of the applications available to users grew and as a greater number of users became proficient with the applications, the whole area of

end-user computing (or end-user information systems as it was also described by some) began to be taken more seriously within the business world, and the strategic importance of the manipulation of these tools began to be taken into account. As early as 1989, commentators were becoming aware that end-user computing was developing an increasing importance in business departments. Kirkley, writing in Computerworld in 1989 refers to the AMA Report on End-User and Departmental Computing. This was the result of a survey completed by 295 Information Systems managers in the United States. The survey showed that 43% of the participant organisations had at least one user department with sole responsibility for its internal budgeting and financial management applications. Connectivity was also growing, with 84% of participant organisations operating systems where PCs and micro terminals were attached to mainframe computers (Kirkley, 1990). The overarching implication of this research and Kirkley's report is that Information Systems departments (or Data Processing departments, as Earl defined them a few years previously) were no longer in control of computer applications – they were starting to deliver a framework in which users operated, rather than providing the applications and systems which ran the business.

Obviously, this presented its own challenges, the more significant of which are outlined below:

2.2.1.2 Management of End-user computing

This became a critical issue within many organisations. Old style methods of managing computer systems and departments did not work well in the new fast-changing sphere of end-user computing. End-users themselves were not computer professionals and could not be managed as such, given that they had other primary roles within the organisation. Henderson and Treacy identify the dilemma faced by those seeking to manage end-user computing as that of striking a balance between the demands of these users while attempting to ensure that end-user computing strategies supported the competitive position of the firm (Henderson & Treacy, 1986, p3)

It would be useful at this stage to explore end-user computing from the perspective of organisational theory with a view to further investigate this dilemma within the organisational context of the time. This is not a straightforward task. (Robey & Zmud,

1992), writing in the early 1990s state that research studies in information systems, particularly with regard to end-user computing often appear to be grounded in a theoretical void. At this point the stated aim of these authors is to stimulate information systems researchers to consider the issue of organisational theory in the area of end-user computing, rather than to propose a solution to the problem.

Returning to the dilemma expressed by Henderson and Treacy, practical rather than theoretical approaches to the problem have been proposed. Gerrity and Rockart for example suggest three possible approaches, these being:

1. The Monopolist approach which is characterised by the maintenance of firm control over all end-user computing.
2. The Laissez-faire approach, which is almost the opposite, with user managers being given free rein to buy whatever computing resources they need (subject to budgetary constraints) and to use them in whichever way they think will benefit their department and the business.
3. The Information Centre approach consisting of a separate department which exists solely to provide guidance and support in the area of end-user computing (Gerrity & Rockart, 1983, p83)

For the purposes of this research, it is intended to concentrate on the Information Centre approach as it is a theoretical approach to the specific issue of end-user computing as has been defined in the earlier parts of this chapter.

Within organisations which took this approach and set up such departments, the overall aim of Information Centres was to set software standards and provide support and training to end-users of standard software. Bergeron et al identify the provision of such support as a critical success factor in the effective use of software and systems in end-user departments, at that point in time (Bergeron et al., 1990). promoting the perspective that people perform better when they are well-trained and supported . From an organisational standpoint, if end-user computing is to be viewed as a strategic resource, then the individuals involved need to be able to work as proficiently as possible in order to aid the strategic aims of the organisation and to understand how to align the tasks they carry out and the outputs they create with organisational strategy.

It has been recognised that this approach, whilst being a popular solution to the end-user computing “problem” had some important limitations. Gerrity and Rockart are of the opinion that Information Centres were often reactive in nature, responding only to expressed user needs. A reactive approach like this can often mean that opportunities for the best exploitation of information technology tools are missed due to lack of user and management sophistication with such tools. This also means that opportunities to take a truly strategic direction in the exploitation of end-user computing are also missed (T. Gerrity & J. Rockart, 1986)

2.2.1.3 Issues within Information systems departments

As end-user computing began to grow in strength, friction developed between Information Systems departments and end-user departments. As end-user computing became an established part of business, Information Systems professionals began to wonder if their jobs were becoming redundant. Kirkley, writing in Computerworld observed that:

“*These days the power is shifting from those who control the technology to those who control the applications. And many key applications are migrating from IS into the enterprise's operating departments*” (Kirkley, 1990, p19).

As technology developed and systems became more flexible, businesses discussed the benefits to be gained from “moving away from the mainframe” to more responsive systems and flexible systems development and application-orientated approach. As Connor states, these ideas were not met with enthusiasm in IS departments, with the fear expressed that such departments would be “traumatised” by such a change. (Connor, 1993)

This is probably an oversimplification of a complex issue. However, literature confirms that things began to change for Information Systems professionals and their departments during the 1980s and early 1990s. Somogyi and Galliers mention data processing people developing their own profession during the 1960s and 1970s. These people started with computer hardware and programming skills and as programming languages developed and hardware became more sophisticated their skillset developed to include the new technique of systems analysis. This was the point at which the above authors identified that “*Computers quickly became*

pervasive" (Somogyi & Galliers, 1987 p4). It can be inferred from this that people with good skills in the aforementioned areas were in high demand for their specialist skills in a developing area. Having said this, contention exists as to whether Information Systems is a true profession, in the same sense that Accountancy might be considered to be such. Orlikowski and Baroudi consider this issue and conclude that Information Systems should be categorised as an Occupational Group rather than a true profession. (Orlikowski & Baroudi, 1988).This is largely to do with the diversity of the tasks carried out by people under this heading and the continuing development and variations in roles.

Having said this, these authors also concede that a major reason for the perceived importance of Information Systems and the status accorded to staff who work in that area is the significance of computers to all aspects of an organisation. This is extremely relevant to a discussion on end-user computing here, as it reinforces the idea that Information Systems professionals are only vital to an organisation as long as user departments have to rely on them for everything related to Information Systems. It is understandable that IS staff felt threatened by the proliferation on personal computers and the development of end-user systems, as described at the beginning of this section.

2.2.1.4 Strategic issues

With the rise of the Internet in the early 1990s coupled with the increasing development of more sophisticated and "user-friendly" applications software, this move from centrally controlled computing towards department-focused end-user applications gathered speed. The strategic importance of end-user systems and developments started to become recognised. End-user software also began to be used in a new way, in the development of strategic information systems, specifically designed to analyse and examine organisational data in alignment with organisational and departmental strategy. Gatian et al observed that organisations who welcomed the development of such systems and the involvement of end-users in their development were shown to gain competitive advantage within their business sphere (Gatian et al., 1995). The same authors also made the observation that senior managers at that time often did not feel that they were getting their money's worth out of Information Technology. The research carried out by these authors

showed, however, that this is not necessarily the case. Companies who were innovative in their use of such technology, particularly in involving end-users who were specialists in their own business departments, were often able to see the use of Information Technology as a tool to help them gain competitive advantage.

In addition to the growth in strategic importance of end-user developed information systems, the issue of return on investment in terms of IT spend was also coming into focus. The issue of the costs versus the benefits of IT was a matter of great debate in the early 1990s. In the days of data processing departments, mainframes and little user input, computing was seen as a fixed cost by many organisations.

With the growth of end-user tools, a more flexible department-based approach to systems development and a greater strategic focus, the cost was not so clear cut. Vincent explores this in more detail in the context of the small, dynamic and flexible units within business departments which were becoming more widespread during this time, undoubtedly associated with the rise in function-specific end-user IT applications. He noted that “The corporation that uses information technology to leverage the efforts of these small entrepreneurial units will position itself to survive in today’s global economy” (Vincent, 1990 p2). He went on to say that the rise of these units and associated systems in organisations was a major contributor to a change in management structure in large corporations. He likened the new business units to tribes in that they were highly mobile and highly communications efficient, able to be more self-sufficient and contributing to a “flatter” management model. In theory, this type of model allowed for quicker assimilation of business information and quicker decision making, all contributing to the gaining of competitive advantage.

2.2.1.5 The end-user population

It is important that we do not forget the importance of end-users themselves in this new landscape. At this point is useful to consider the question as to how business employees gained the skills necessary for them to do their jobs and also how the changes affected them, both positively and negatively. This is important when considering systems used for functional and procedural tasks, but also critical when considering that they were often using computers to aid decision making at a strategic level.

2.2.1.5.1 Training

This was recognised by many organisations and a great deal of applications training took place in an attempt to ensure that a wide range of staff were equipped to deal with the new requirements being put upon them. This also had an effect on staff providing the applications training.

Garavan and McCracken refer to Rockart and Flannery's six types of end user but identify these user types slightly differently in the context of training. They identify a typical end-user in need of applications training as generally coming from the "command-level end-user" category. These people can be sub-categorised as "direct" users who needed to use PCs in their day-to-day work but also as people who also knew nothing about programming. (Garavan & McCracken, 1993). As they are trained, these users become more confident and sophisticated and wish to use their new skills to address more complex problems, absorbing more and more resources in terms of support. It is in indicative of the situation with regard to the resource-heavy nature of this type of training and support that it was often contracted out.

Having accepted that there were issues with the provision of applications training, it can also be concluded that the gaining of new skills which could be applied to job roles was a positive feature of the growth in end-user computing, certainly for those end-users who felt equipped to rise to the challenge. However, there was a negative aspect which should also be explored briefly, and this is the issue of what was termed "computer anxiety", experienced by many end-users as they entered this new world.

2.2.1.5.2 Computer anxiety

Given the nature of the new tasks and requirements, it was inevitable that the adoption of a more end-user approach towards computing was not a straightforward transition for all employees or their organisations, even though training encouraged a large number to enhance their skills and recognise the ways in which computers and software could enhance their job performance.

It has already been mentioned that computing professionals felt uneasy that their jobs were changing and were not as safe as power shifted towards end-user

departments. However, the end-users themselves were also likely to feel uneasy with the new focus of their jobs. A whole body of literature developed, concerning the idea of “computer anxiety”.

Powell undertook a comparison review of the literature in the area of “computer anxiety”, reviewing a substantial number of articles (276 articles in total). This leads to the conclusion from this author that the subject is something which would benefit from further research. A key observation from this comparison study in the context of this thesis is that the ways in which computers were changing lives and jobs towards the end of the twentieth century meant that organisations needed to pay attention to the anxiety resulting from their employees’ natural resistance to change (Powell, 2013).

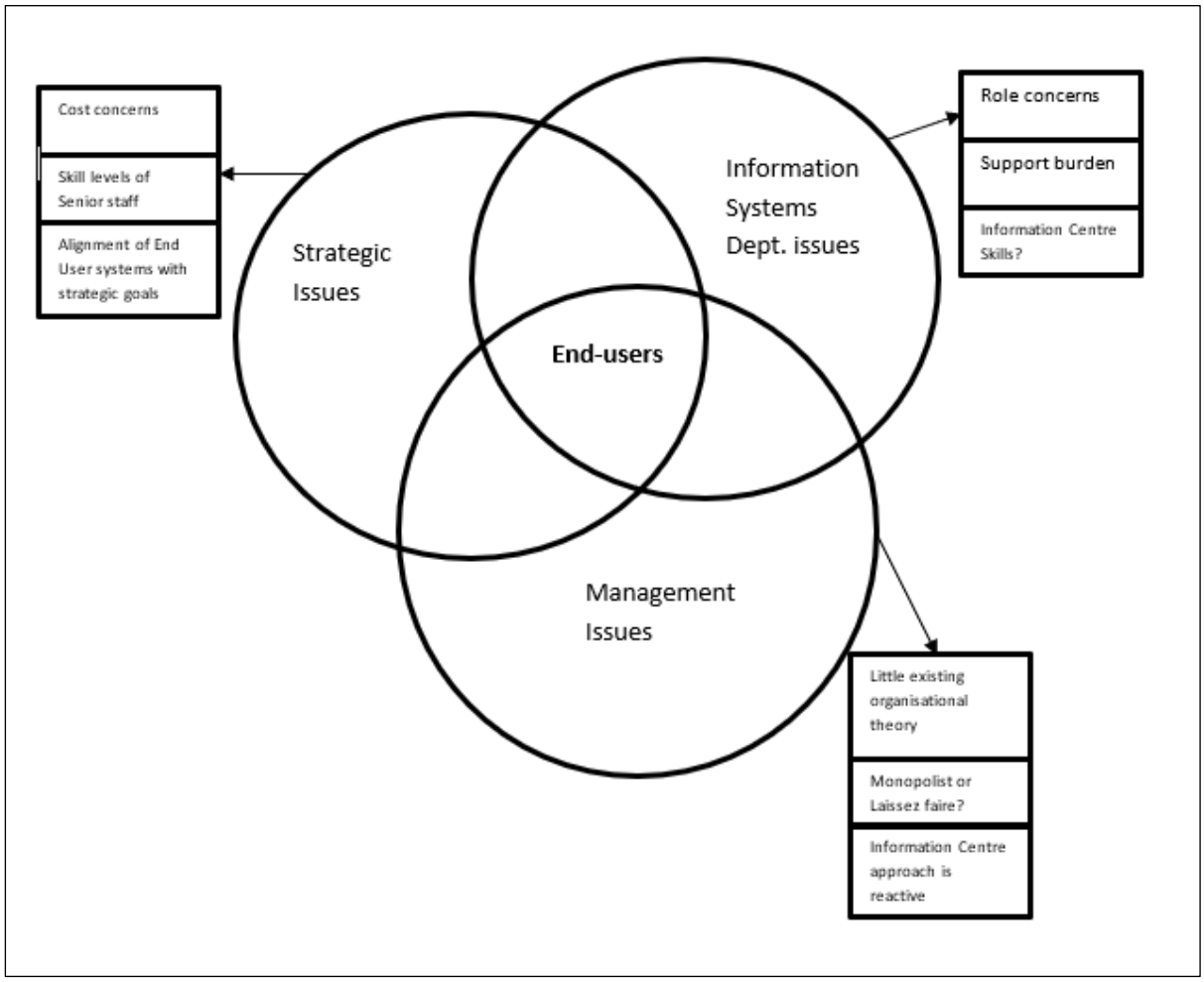
The success of end-user applications and systems could only be guaranteed if this anxiety could be allayed by training or other interventions.

2.2.1.6 Conclusions and lessons for the present day

It is evident from the literature that the rise in end-user computing during the 1980s and 1990s was neither straightforward or linear. A range of issues and problems became apparent which were only partially dealt with by the development of Information Centres and the increase in end-user training. At attempt has been made to clarify the main issues outlined above, by way of the diagram shown in Figure 2.3 placing end-user computing at the centre of a range of business issues and

associated problems, which was very much the picture at the time.

Figure 2.3 Issues associated with end-user computing



In current times the issues associated with information systems in business have changed somewhat. Information systems tools have become much more sophisticated, and staff are deployed in a range of roles which are very different to those at the latter end of the previous century. It is not within the scope of this thesis to discuss these changes in detail. However, many business employees still operate as “end-users” with regard to the use of IT within their departments and they are still affected by Strategic, Management and IS issues in their use of their desktop tools.

With regard to the subject of this thesis, the concept of end-user computing is extremely relevant when we consider Business and Management graduates entering the world of employment. It could be said that these graduates are joining organisations as modern end-users. They are being employed in business roles rather than IT roles, but they need to use IT applications to a level which will enable them to do their jobs. More specifically, given the growth in the importance of data to

business over the last two decades (which will be dealt with in 2.2.2) they need to be able to demonstrate an appropriate level of data literacy.

The summary of the authors on the next page identifies the key sources used in 2.2.1, in the order in which they were used.

Table 2.2 List of authors as they appear in Section 2.2.1

Author	**Contribution to section**
Peng, G. (2017). "Do computer skills affect worker employment? An empirical study from CPS surveys." Computers in Human Behavior **74**: 26-34.	Evidence of the importance of computer use in employment.
Regan, E. A. (2002). End-user information systems : implementing individual and work group technologies.	Definition of end-user computing. Examination of fourth-generation software tools used in the development of end-user systems.
Valacich, J. S. (2016). Information systems today : managing in the digital world.	Definition and explanation of decision support systems based on spreadsheets and databases developed and used by end-users both in the early days of end-user computing and also in current times.
Rockart, J. and L. Flannery (1983). "The management of end user computing." Communications of the ACM **26**(10): 776-784.	Definitions of six different types of end-user in the 1980s. Definition of key issues in end-user computing identified by Information systems professionals.
Bergeron, F., et al. (1990). "Investigating the Support Role of the Information Center." MIS Quarterly **14**(3): 247-260.	Recognition of the great change in organisational practices effected by the advent of end-user computing. Identification of the support and training offered by Information Centres as a critical success factor in the effective use of software and systems in end-user departments.
Earl, M. J. (1989). Management strategies for information technology	Exploration of his theory of the transition from the Data Processing era to the Information Technology era in business.
Gerrity, T. and J. Rockart (1986). "End-User Computing: Are You a Leader or a Laggard?" Sloan Management Review **27**(4): 25.	Exploration of end-user computing through the theory of three different eras – First era (accounting and clerical applications), Second era (direct operational support and Third era (Information era).

Author	Contribution to section
Gerrity, T. and J. Rockart (1986). "Wanted: effective leaders to manage end-user computing." Computerworld **20**(36): 83.	Proposition of three possible approaches to the management of end-user computing, these being: • The Monopolist approach • The Laissez-faire approach • The Information Centre approach Recognition that the Information Centre approach can often be reactive, missing opportunities to use end-user tools in a truly strategic manner.
Kirkley, J. (1990). "Is this this the beginning of the end for IS professionals? (information systems) (column)." Computerworld **24**(3): 19.	Analysis of the 1989 AMA report of 295 Information Systems managers in the United States exploring the proliferation of departmental end-user systems in business. Examination of the shift in "power" between Information Systems departments to end-user departments.
Henderson, J. and M. Treacy (1986). "Managing End-User Computing for Competitive Advantage." Sloan Management Review **27**(2): 3.	Identification of the dilemmas associated with the management of end-use computing, striking a balance between the demands of the users and supporting the competitive position of the firm.
Robey, D. and R. Zmud (1992). "Research on the Organization of End-User Computing: Theoretical Perspectives From Organizational Science." Information Technology & People **6**(1): 11-27.	Recognition that there was little organisational theory applied to the management of end-user computing during the 1980s and 1990s.
Somogyi, E. K. and R. D. Galliers (1987). "Applied information technology: From data processing to strategic information systems." Journal of Information Technology **2**(1): 30-41.	Exploration of the development of the profession of Data Processing during the 1960s and 1970s.
Orlikowski, W. J. and J. J. Baroudi (1988). "The information systems profession: myth or reality?" Office Technology and People **4**(1): 13-30	Proposition that Data Processing/Information Systems is not a profession, but an "occupational group". The importance of computers to all aspects of organisations leads employees in Data Processing/Information systems departments to consider themselves part of a recognized profession.

Author	Contribution to section
Gatian, A. W., et al. (1995). "Organizational innovativeness, competitive strategy and investment success." The Journal of Strategic Information Systems **4**(1): 43-59	Observation that organisations who welcomed the development of end-user systems were shown to gain competitive advantage in their business sphere.
Vincent, D. R. (1990). "Information technology--should you curtail your investment?" Financial Executive **6**(3): 50-56.	Exploration of the competitive advantage offered by the development of “small entrepreneurial units” of end-users.
Powell, A. L. (2013). "Computer anxiety: Comparison of research from the 1990s and 2000s." Computers in Human Behavior **29**(6): 2337-2381.	Longitudinal study of literature around the subject of “Computer anxiety” and employees, concentrating specifically on the idea of natural resistance to change.

2.2.2 The Information Age

"*What characterises the current technological revolution is not the centrality of knowledge and information, but the application of such knowledge and information to knowledge generation and information/communication processing devices, in a cumulative feedback loop between innovation and the uses of innovation*" (Castells, 2010, p68)

Although there is a recognition within business that data and the information generated from data is absolutely key to business success in current times, it is difficult to find a definition for this concept. It is possible to talk about "the age of Big Data", but this is not the complete picture. We know that businesses currently have access to an almost limitless amount of data, generated internally and available externally. The important aspect of this is to be able to understand the data that is available and use it well to the advantage of the business. This is why data literacy is such a key skill in the business world. With regard to the quote at the beginning of 2.2.2, this explains the importance I attach to the idea of the application of knowledge and information to the process of knowledge generation within business. Continuous generation of knowledge derived from data and information is a critical factor in the success of businesses. Data literacy is the skill which enables this knowledge generation to happen. For the purpose of this Literature Review, I am referring to the time when data and its transformation into information became so vital to the business world as "the Information Age". This is not a temporal definition, but a reference to the growing significance of data and information as described above. The importance of data literacy skills during this increased focus on data and information is referred to by Calzada Prado and Marzal who refer to this as the growth of the "Information Age" (Calzada Prado & Marzal, 2013)

It must be made clear that the purpose of this thesis is not to address the issue of the developments and innovations within the various technologies which allow the processing of the data. I am interested in the people who work with the data and information and help to build the knowledge which in turn helps business to develop and thrive. At the end of the last century these people were often the end-users described in the 2.2.1. Nowadays they are the people who use data and create information within a range of business departments. These are often Business and

Management graduates. This section is about the world in which they find themselves as they enter employment.

In this section, the shift towards end-user computing at the end of the last century will be explored to explain the ways in which it sowed the seeds for the development of the Information Age as it is defined in 2.2.2, introducing some concepts and definitions regarding the importance of computer use in business, particularly as it relates to data management. As mentioned earlier this will be done from the perspective of the people rather than the technology in an attempt to position our Business and Management graduates within the this "Information Age", starting with some comparisons between the two perspectives.

2.2.2.1 Moving into the "Information Age"

2.2.1 began with Peng and his observation that Information Technology and computer skills have become increasingly important in business life (Peng, 2017). Some analysis of available literature from the late 20th Century has given us some useful insights as to how this came into being during this time.

We can see how the rise in end-user computing in the 1980s and 90s began the movement towards the ways in which Information Technology and the management of data are organised in business today. While modern technology and applications are undoubtedly much more sophisticated, the idea of small, functional units with excellent communications and mobility, operating in a dynamic manner to aid decision-making are very recognisable in modern day business. The main difference between the 1990s and the modern day is the sheer amount of data which is now produced and which is available to be exploited by business. Development of internet tools and the ability of organisations to generate large amounts of data across the world make it even more critical that users of this data at a business departmental level have appropriate skills both to allow them to do their jobs and also to continue to use the data available to them to aid the strategic aims of the business.

Literature examined in this chapter leads us to the conclusion that the current landscape is vastly different with regard to the sophistication of the hardware, software and infrastructure of business computing than it was at the end of the last

century. However, it can be inferred from this literature that it was the move to end-user computing and Earl's "IT era" which precipitated the ways in which computers are used in modern business. A visitor to any office in any type of business setting in the modern day will see a computer on every desk. These computers, even in relatively small organisations will generally be connected to at least a local area network, probably an Intranet or private network and ultimately the Internet. Employees (not computing professionals) will be using these computers for a variety of tasks, most to do with the processing of data and information and aiding in the generation of organisational knowledge.

At this point, it is worth considering what is meant by the term "knowledge" and particularly organisational knowledge. Human knowledge has been subject to philosophical debate and definition since the Ancient Greeks (Denizhan Kalkan, 2008). Within the whole study of knowledge, the concept of organisational knowledge is also not easy to define. Knowledge Management literature often uses Nonaka's paradigm of organisational knowledge as being either tacit (implicit) or explicit (Nonaka, 1995). Tacit knowledge can be described as "Rooted in action, experience, and involvement in a specific context" (Alavi & Leidner, 2001, p110) whereas explicit knowledge is more codified and procedural (Brockmann & Anthony, 2002). Examples of explicit knowledge might be standard operating procedures, libraries, archives.

Organisational knowledge is often developed from the exchange between these two defined types of knowledge. Tacit knowledge can be used in the development and improvement of procedures and protocols, while explicit knowledge can be used to inform decision-making, leading to the development of more tacit knowledge. Theoretically, knowledge exchange of this type should lead to organisational improvement and development but it is often not straightforward (Herschel et al., 2001) and needs to be managed.

2.2.2.2 Knowledge workers

The importance of knowledge work in business is not a new concept. In 1959, in "Landmarks of Tomorrow" Peter Ducker described the rise of the importance of "knowledge work". Towards the end of the 20th Century Drucker expressed the opinion that knowledge was a more crucial economic resource than land, labour, or

financial assets and that increasing the productivity of knowledge workers was "*the most important contribution management needs to make in the 21st century*" (Harvard Business Review, 2014).

At this point, accepting the importance of knowledge to business, it is worth considering what is meant by the term "knowledge worker". Are they the people defined as "end-users" in the previous century? Do they do the kind of jobs that our Business and Management graduates take up? There is criticism of the term in literature as it is often used without definition and applied to a range of different types of work. Surawski echoes several authors in stating that the term is "*fuzzy, variously interpreted and used with vague definitions or without defining*" (Surawski, 2019, p105). This author does eventually come to the conclusion that the term is most usefully linked with what used to be called "white-collar" workers, these being people with management or administrative jobs.

This association with management and administration coupled with another definition by De Sordi et al:

""*The term knowledge worker applies to professionals whose work is highlighted by the continuous, systematic and predominant expansion of organizational knowledge through the mechanism of exploration*" (De Sordi et al., 2021, p65)

This definition implies that "knowledge worker" might be a useful term for the type of worker our Business and Management graduates are expected (and expecting) to become. De Sordi's definition also suggests that knowledge workers need data literacy skills. The exploration which results in the expansion of organisational knowledge can surely best be done in the modern day by the management, analysis and interpretation of organisational data.

Positioning current Business and Management graduates within the present-day world of Big Data and associated analytics, it is therefore useful to consider that they may be defined as knowledge workers. They are generally entering a diverse range of "white-collar" jobs where they are likely to be expanding organisational knowledge to the advantage of the businesses in which they are employed. Given that definitions for the term "knowledge worker" are hard to find, it would be interesting to explore the concept of this type of job during my research interviews, with a view to

gaining a better understanding of what might be expected of Business and Management graduates by employers and the graduates themselves.

2.2.2.3 Big Data and Business Intelligence

Having attempted to position Business and Management graduates and their likely job roles within the current data rich and complex landscape, this final part of 2.2.2 will concentrate on the technological landscape likely to be encountered by these graduates when they enter employment. It was stated at the beginning of this section that there was no intention to concentrate on the details of the technology, as this is not the focus of this particular research area. However, as the subject under discussion is data literacy, it is important to have some discussion about the subject of data and how it is currently dealt with in business, given the amount of growth and change in this area.

It is evident that in recent years, the amount of data which is now generated by business has increased exponentially and a range of sophisticated computer systems have been developed to help organisations exploit this data in a bid to increase competitive advantage. What used to be called Decision Support has now been transformed into “Business Intelligence”. Decision support systems are traditionally built to solve particular problems or evaluate business opportunities. Business Intelligence software monitors situations (generally in real time) in an attempt to identify problems/opportunities using data analytics (Turban, 2013, p33) Decision support systems are still in use today, often in smaller businesses or workgroups where standalone software models can be built using spreadsheet or database software. Such models are built in order to examine business data and are generally used to analyse and predict outcomes based on this data. Business Intelligence is used for broadly similar purposes, but the concepts behind Business Intelligence are inextricably linked with what is now generally thought of as “Big Data”. There have been several definitions of the concept which have developed over time. Originally was defined as Big if it has the characteristics of being high-volume, high-velocity and high-variety (sometimes referred to as the three Vs) Over the years other “Vs” have been added. Veracity, for example describes data which is imprecise and uncertain, such as sentiment data that can be extracted from social media sources. This data is still valuable and tools exist for its collection and

analysis. Variability (and complexity) is another “V” referring to data which is variable in terms of peaks and troughs of flow over time as well as being generated from multiple sources. Again, modern analysis tools make this data valuable. (Gandomi & Haider, 2015)

These definitions demonstrate that Big Data is different to the more controlled, localised type of data which might be managed in a traditional decision support system. As described above such data needs a different set of software tools with which it can be used and managed.

Big Data Analytics are how these tools are normally described. Sun et al define Big Data Analytics as “*a method or technique that uses data, information, and knowledge to learn, describe, and predict something*” (Sun et al., 2018, p68), referring back to Ackoff’s pyramid. Big Data Analytics result in Business Intelligence, this being information which can help to inform the strategic direction of a business and possibly also help to increase competitive advantage (Rialti et al, 2020)

From the perspective of this thesis, there is evidence that employers expect Business and Management graduates to have some skills and abilities with both decision support systems and business intelligence. For example, Maggitti defines the analysis of data as one of the top three skills that employers want from graduates (the other two being critical thinking and challenging of the status quo) (Maggitti, 2015). He further describes this skill as “*the ability to analyse data – to understand what data is needed, how to manage it and how to extract and assess the critical information*” (Maggitti, 2015). This definition contains similarities to the Universities UK definition of data literacy, previously explored. Its relevance to graduate employability, given the perception of its importance to employers will be dealt with in 2.4.

2.2.3.4 Contrasting the “Era of Information Technology” and “the Information Society”

Before leaving this section, it is a useful exercise to contrast the issues identified here with those addressed in 2.2.1 regarding what has been identified as end-user computing. The diagram at the end of 2.2.1 identifies these issues from three perspectives, these being Strategic issues, Information systems department issues and Management (of end-user computing) issues. It would be useful to conclude this

section with a brief analysis of the people we might define as knowledge-workers from the same perspectives.

2.2.3.4.1 Information systems department issues

The concept of the Information Systems department is very different in the 21st Century than it was in the 1980s and 90s. In fact, the concept of Information systems itself is now outdated, with much more focus on Enterprise systems and interoperability between systems both within organisations (vertical interoperability) and between organisations (horizontal operability) (Zelm, 2018). This interoperability is largely possible due to the advent of Big Data and the tools used to store and manage it.

With regard to the storage of data, the concept of cloud computing means that many organisations do not store their own data themselves. The cloud:

"*transforms storage infrastructure and computing power into services through the intermediary of companies that possess servers and rent out their capacities*" (Monino, 2016).

There is also the consideration of "open data" which is "data that can be freely used, re-used and redistributed by anyone - subject only, at most, to the requirement to attribute and sharealike" (Open Knowledge Foundation, 2018). Open data is that which is made available in the public domain by a variety of contributors including government bodies and social media organisations. This is obviously very different to the days of the traditional IS department where company data belonged only to the company, was stored on company premises and managed by company employees.

As well as increased fluidity and flexibility around data storage as described above, increasingly sophisticated technologies are now available to manage data and information within the organisation. In fact, as well as data being stored in the cloud, applications are also available and cloud-based solutions are often used to facilitate complex Enterprise IT systems in bringing together a range of technologies in an attempt to create a unified work environment. "*Enterprise IT infrastructure is complex and no solution sits in isolation*" (technative.io, 2020). Such infrastructure relies on a number of technologies working together, not all of them being implemented by the same provider.

Returning to the subject of the IS department it can be deduced that the adoption of the above technologies in many organisations has meant that boundaries between traditional IS functions and other functional departments in business have been blurred. Less hierarchical management styles have become the norm in many businesses and departments but the various new technologies that have developed (Enterprise systems and interoperability, Big Data, the Cloud etc.) have meant that IS functions have probably been had more stimulus to change.

The purpose of this thesis is not to examine management styles in detail, but it is worth pausing to consider the contrast between styles of the 20th and 21st Century, as they have some bearing on the changing world of IS. Denning contrasts 20th century management styles with those of the 21st century by defining those of the 20th century as bureaucratic and hierarchical, while the 21st century approach has evolved into small self-organizing teams working in short cycles, focusing tightly on delivering value for customers (Denning, 2020, p14). While this author is discussing management in general, and the move to more customer focused rather than shareholder focused approaches to business (which is outside the scope of this thesis) it is relevant to consider these changes as they apply in the specific context of IS management in the Information Age as defined in 2.2.2.

Developments in technology over the years and associated changes in management style means that one of the main issues addressed in 2.2.1 has been subject to change. In 2.2.1.3 the friction between IS departments and end-user departments was discussed, with particular reference to the unease with which IS professionals regarded the development of skills in the end-user population. With less hierarchical management styles and Enterprise IS solutions resulting in more functions being operated remotely by different providers the problem of friction between IS professionals and end-users is likely to no longer be a major issue.

If we consider the staff defined as knowledge workers to be the modern end users, this means that they are likely to be no longer constrained by their relationship with IS departments and staff. However, they are working in much more complex environments than those of the late 20th Century with less structured management to guide them. These two factors are likely to bring challenges of their own.

2.2.3.4.2 Strategic issues

As end-user computing began to be recognised as an important part of the IT landscape the strategic value of end-user decision support systems were recognised as important to business in the gaining of competitive advantage. With the arrival of Big Data and the development of Business Intelligence tools, the management of data is generally considered to be of great strategic importance to organisations. Williams comments that companies which excel in the use of Business Intelligence (BI) demonstrate increased competitive advantage, also noting that the more complex and information-intensive a business, the greater the strategic importance of BI (Williams, 2016). For such organisations, making use of Big Data Analytics to create BI can allow for a greater amount of strategic flexibility (Rialti et al., 2020) which in itself can be a factor in the achievement of competitive advantage.

It is important to stress here that it is not the actual data which is considered to be a strategic asset. As stated previously Big Data has several characteristics which only make it valuable once tools have been used to analyse it. From the perspective of this thesis, it is the analysis which is important. Even more important are the people who are involved in this analysis. If we understand that the people who work with data in organisations are those with data literacy skills (the knowledge workers) and we also understand that it is the BI which is produced from the analysed data which is of strategic importance, we can extrapolate this to an expectation that such workers will also be considered to have strategic value.

There is however little in the literature to support this observation. There is much about the importance of tools such as BI and BDA as discussed above but very little about the people who use these tools and skills they need. This is possibly further evidence of the gap regarding the recognition of data literacy as a valuable skill in the workforce, which was mentioned in Chapter 1, regarding the UK Government Digital Skills Strategy and the Skills for Jobs White Paper.

2.2.3.4.3 Management issues

Continuing from the observations made above, it becomes clear that there are many differences between the era of end-user computing and the present day. Big Data, technological complexity and less bureaucratic management styles make it difficult to identify employees who might once have been known as “end-users”. If we attempt

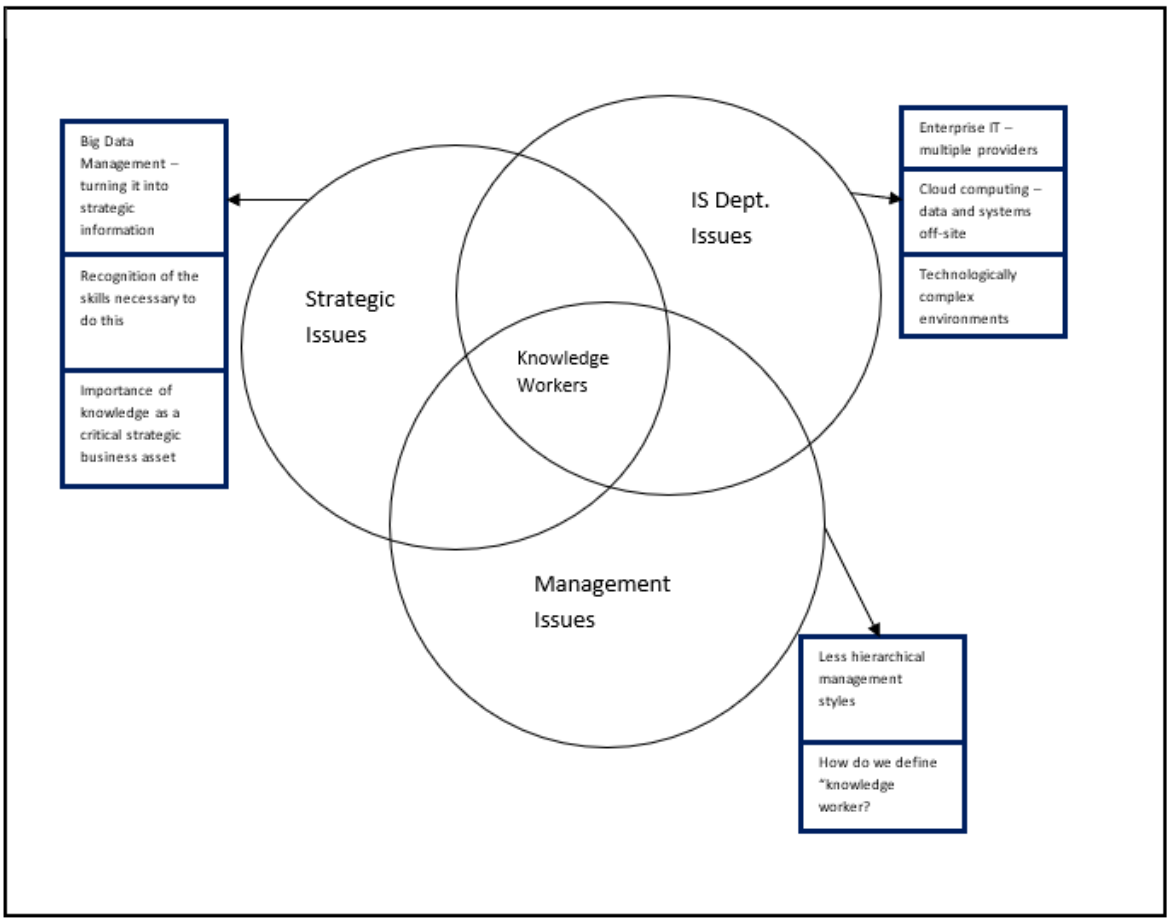
to define these employees as knowledge workers, there is little consensus over what this definition actually means. For the purpose of this thesis, if we consider that such a definition includes “white-collar” workers who are involved with the expansion of organisational knowledge then this could include individuals working in a range of departments. Organisational knowledge exists throughout the organisation.

This points to similarities with the end-users described previously, who were also employed throughout the organisation. In terms of management of knowledge workers however, the situation is very different. End-users were recognised and managed as such, in addition to being managed in their jobs. Information Centres were established to deal with end-user issues, including setting of standards and user training. The less hierarchical management styles adopted today do not support such structured ways of working and the proliferation of different technologies also makes management of the knowledge worker community more difficult.

It is interesting that literature over several decades describes the criticality of knowledge as a vital strategic resource in business. However, the difficulty in identifying and defining who the people are who are involved with creating and expanding this knowledge implies that the management of this resource is not being carried out as effectively as it could be. If we do not know exactly who the knowledge workers are, it is difficult to manage their productivity. This is a possible area for further research.

Figure 2.4 demonstrates the “new” issues faced by business mapped onto the same framework as those discussed in 2.2.1

Figure 2.4 Revisiting issues identified in Figure. 2.3



The summary of the authors on the next page identifies the key sources used in 2.2.2, in the order in which they were used.

Table 2.3 List of authors as they appear in Section 2.2.2

Author	**Contribution to section**
Manuel, C. (2010). Globalisation, Networking, Urbanisation: Reflections on the Spatial Dynamics of the Information Age. *Urban studies (Edinburgh, Scotland)*	Definition of the importance of knowledge in the Information age.
Harvard Business Review. (2014). What Peter Drucker knew about 2020? Retrieved from https://hbr.org/2014/10/what-peter-drucker-knew-about-2020	Analysis of Drucker's work on the crucial importance of knowledge as a vital economic asset and the necessity to increase the productivity of knowledge workers.
Surawski, B. (2019). Who is a "knowledge worker" – clarifying the meaning of the term through comparison with synonymous and associated terms. *Management (Zielona Góra), 23*(1), 105-133	Addressing the problems with defining the term "knowledge worker".
De Sordi, J. O., Azevedo, M. C. d., Bianchi, E. M. P. G., & Carandina, T. (2021). Defining the term knowledge worker: Toward improved ontology and operationalization. *Knowledge and process management, 28*(1), 56-70	Further discussion on definition of the term "knowledge worker" Discussion of the term in the context of the expansion of knowledge through discovery (about and within the organisation).
Turban, E., Sharda, R., & Delen, D. (2013). *Decision Support and Business Intelligence Systems: Pearson New International Edition*: Pearson Education M.U.A.	Transformation of Decision support systems into Business Analytics and Business Intelligence.
Gandomi, A., & Haider, M. (2015). Beyond the hype: Big data concepts, methods, and analytics. *International journal of information management, 35*(2), 137-144	Discussion on the definition of Big Data. Big Data is only useful if appropriate tools and skills are used to analyse it. With the right skills and tools even low-value, variable data is useful, given the volume of data available.

Author	Contribution to section
Sun, Z., Sun, L., & Strang, K. (2018). Big Data Analytics Services for Enhancing Business Intelligence. *Journal of Computer Information Systems, 58*(2), 162-169.	Discussion on the definition of Big Data Analytics.
Maggitti, P. (2015, 02/06/2015). Be the Problem Solver. *US News and World Report*.	Justification of the reasons why data-analysis is one of the top three skills that employers want from graduates. This author is Dean of the Villanova School of Business
Zelm, M. (2018). *Enterprise interoperability : smart services and business impact of enterprise interoperability* (1st edition. ed.): London, UK	Enterprise systems and interoperability between systems from different providers. Big Data tools and services have facilitated the development of Enterprise systems.
Monino, J.-L. (2016). *Big data, open data and data development* (1st edition. ed.): Hoboken, New Jersey : ISTE Ltd/John Wiley and Sons Inc	Explanation of Cloud Computing. Not just data, but also data applications and services.
Open Knowledge Foundation. (2018). What is Open Data? Retrieved from https://opendatahandbook.org/guide/en/what-is-open-data/	Definition of Open Data.
technative.io. (2020). Role of Third-party Technology Suppliers in a 'Cloud First' Solutions Environment. Retrieved from https://technative.io/role-of-third-party-technology-suppliers-in-a-cloud-first-solutions-environment/	Exploration of the complexity of Enterprise systems scenarios.

Author	Contribution to section
Denning, S. (2020). The challenge: 20th Century vs. 21st Century management. *Strategy & leadership, 48*(6), 11-19	Discussion of the move away from bureaucratic and hierarchical management styles towards smaller self-managing teams working in a more project-orientated fashion. Relevant when considered in the context of IS management.
Williams, S. (2016). *Business intelligence strategy and big data analytics : a general management perspective* (1st edition. ed.): Amsterdam, Netherlands : Morgan Kaufmann.	The strategic importance of Business Intelligence with regard to competitive advantage. This is even more true in the case of complex and information-intensive businesses.
Rialti, R., Marzi, G., Caputo, A., & Mayah, K. A. (2020). Achieving strategic flexibility in the era of big data: The importance of knowledge management and ambidexterity. *Management decision, ahead-of-print*(ahead-of-print)	The role that Big Data Analytics play in allowing organisations to display strategic flexibility.

2.3. Business and Management Graduates and Employability

2.3.1 Business and Management graduates – who are they and what do they do?

The purpose of this section is to examine Business and Management graduates within the generation into which they have been born, examining what is unique about this generation. This section will address how their "uniqueness" may affect both their data literacy skills and also the ways in which they might engage with teaching of data literacy subjects. This will also be considered in more detail in the research interviews as it is very pertinent to my research question.

This section will also examine the background to the concept of employability as it affects this group of graduates, starting off with an exploration of how and why employability came to be such an important feature of undergraduate degree programmes. Having established that employability is a key feature of all Programmes, the section will briefly address the issue of employability as it applies specifically to Business and Management graduates. The section will conclude with a review of the employability models with commentary as to how these models have developed and how they are applicable to Business and Management graduates in the context of data literacy.

2.3.1.1 Generation Z and Digital Natives

In the first two decades of the 21st Century the concepts of a generation defined as Generation Z (those born between 1980 and 2000), (Mintel Group, 2018) and the Digital Native were much discussed, particularly in relation to the digital tools with which this generation had grown up. Prensky was the author who defined this generation as "digital natives" and he refers to the "the arrival and rapid dissemination of digital technology in the last decades of the twentieth century" as a fundamental and irreversible change or "singularity" (Prensky, 2001), particularly affecting those defined as Digital Natives.

Current Business and Management students and graduates fall right at the end of the group identified by Mintel as Generation Z and Prensky describes how being part of this generation makes them different to their predecessors, saying "Today's students – K-12 through college –represent the first generations to grow up with this new technology. They have spent their entire lives surrounded by and using computers, videogames, digital music players, video cams, cell phones, and all the

other toys" (Prensky, 2001). Given that this author was writing in 2001, it is likely that today's students are conversant with a whole range of additional digital "toys" which they use on a daily basis. An important part of the rationale behind my research is to attempt to discover if this familiarity with digital technology in general translates to greater levels of data literacy amongst those defined as Generation Z undergraduates and graduates.

There is great deal of literature centred around the concept of the digital native and I intend to critically engage with this literature in the context of undergraduate data literacy skills throughout this thesis. As stated above, I am interested in how well those identified as digital natives by their year of birth and familiarity with technology fare when they need to develop data literacy skills as undergraduates and ultimately how this affects their ability to assimilate into the business workplace.

When considering the development of data literacy skills during their undergraduate education, I am also interested in how these digital natives respond to teaching in areas that might be defined as data literacy. Does the difference that is perceived in their ease of use of technology also affect the way they react to teaching in a technology-related area such as those associated with data literacy skills?

There is little in the literature which deals with the specific issue of data literacy teaching, but several authors, including Prensky have commented that people characterised as Digital Natives have different expectations of learning and actually learn in different ways. Gaston describes this as a distaste for "passive" learning, a need for instant answers and an ability to multi-task (Gaston, 2006). More recently. Costina Denisa describes digital natives as those who "can distribute ideas and knowledge and interconnect in a continuous 24/7 environment" (Costina Denisa, 2020, p137) and Ding and Stapleton comment on the importance of mobile communication and online social networks to the lives of undergraduates (Ding & Stapleton, 2015).

In summary we can conclude that our modern-day undergraduates and recent graduates are somewhat different to previous generations, certainly in terms of their familiarity with digital devices. They live in a non-linear, multitasking and always

connected world and it is possible that this also affects the ways in which they respond to traditional methods of learning. Examination of both their characteristics as digital natives and also their reaction to the ways in which they are taught data literacy subjects at University will be examined during my interviews with all stakeholder groups. It is likely that all groups will have some perception of both of these areas and views on both the positive and negative features of graduate data literacy skills as they enter employment.

Section 2.3.1.2 explores the types of employment that are open to Business and Management graduates, demonstrating the diversity of likely careers available to these graduates.

2.3.1.2 Business and Management graduate careers

It is worth indicating and exploring the difference between Business and Management degrees and more specialised degrees within the business area. Business and Management degrees are generalist in nature, and it is fair to say that the types of employment entered into by Business and Management graduates varies across a wide range of organisations and job roles. University careers services, recruitment agencies and other organisations involved in the graduate employment sector provide information to Business and Management students regarding the type of career opportunities available to them. To take one example, Graduate Prospects Ltd., their website provides a long list of graduate careers which can be directly related to a Business and Management degree. These are detailed as follows:

- Actuarial analyst
- Business adviser
- Business analyst
- Chartered management accountant
- Corporate investment banker
- Data analyst
- Data scientist
- Forensic accountant
- Insurance underwriter
- Management consultant
- Operational researcher
- Product manager
- Project manager
- Risk manager

- Social media manager
- Stockbroker
- Sustainability consultant (Graduate Prospects, 2020)

This demonstrates that, unlike Law or Accountancy, the career choices of a Business and Management graduate are many and varied so job-specific employability skills are harder to define. It would be useful to see some more detailed descriptions of the skills required for these jobs. It is, however, likely that jobs which include the words “analyst”, “consultant”, “researcher” “accountant” etc. are likely to rely heavily on skills in data management and interpretation, at a relatively advanced level. A modern Business and Management graduate, starting out in a career for which their degree supposedly fits them, will therefore be required to demonstrate the possession of these skills as many of the job titles in this list would appear to require both considerable understanding of data uses coupled with higher level data analysis skills. Individuals employed in jobs with these titles would also very likely fit the definition of knowledge-workers, as previously discussed.

The list of authors on the next page serves to identify key sources used The summary of the authors on the next page identifies the key sources used in 2.3.1, in the order in which they were used.

Table 2.4 List of authors as they appear in Section 2.3.1

Author	**Contribution to section**
Mintel Group, L. (2018). *Technology Habits of Generation Z - UK - September 2018*: Mintel Group Ltd	Definition of Generation Z.
Prensky, M. (2001). Digital Natives, Digital Immigrants Part 1. *On the horizon, 9*(5), 1-6	Prensky was the author who coined the term "Digital Native" to describe the first generation of people born into an age of digital technology. He describes the emergence and rapid growth of digital technology at the beginning of the 21st Century as a fundamental and irreversible change or "singularity"
Gaston, J. (2006). Reaching and Teaching the Digital Natives. *Library hi tech news, 23*(3), 12-13	Discussion of the ways in which Digital Natives learn. Specifically, they have distaste for "passive" learning, a need for instant answers and an ability to multi-task.
Costina Denisa, B. (2020). Teaching the Digital Natives. *Revista de stiinte politice* (65)	Exploration of the idea that Digital Natives can distribute ideas and knowledge and interconnect in a continuous 24/7 environment. This needs to be taken into account by those who teach them.
Ding, F., & Stapleton, P. (2015). Self-emergent peer support using online social networking during cross-border transition. *Australasian journal of educational technology, 31*(6)	Commentary on the importance of mobile communication and online social networks to the lives of undergraduates
Graduate Prospects. (2020). Business Management. Retrieved from https://www.prospects.ac.uk/careers-advice/what-can-i-do-with-my-degree/business-management	List of the types of careers taken up by Business and Management graduates.

2.3.2 Graduate Employability

2.3.2.1 Changes in UK Higher Education

The publication of the Robbins Report in 1963, with its concentration on the expansion of university provision, sowed the seeds for the current approach to Higher Education in the UK. This report was the main output of the Committee on Higher Education chaired by Lord Robbins between 1961 and 1964. According to Wallace, this report "*recommended an expansion in university provision to allow all suitably qualified candidates an opportunity for higher education should they wish it*" (Wallace, 2015, p43). This was the start of the expansion of Higher Education provision, evidenced by the development of 9 new "green field" universities and the conversion of former Colleges of Higher Education into Universities. Following on from this, the 1992 Further & Higher Education Act resulted in 41 existing Polytechnics transforming themselves into Universities. To quote Melville in 1998 "*We began the millennium with 19 Universities - we will end it with at least 90*"(Melville, 1998, p9). According to Universities UK, in 2018–19, there were 165 higher education institutions in the UK in receipt of public funding via one of the UK funding councils that returned data to the Higher Education Statistics Agency (Universities UK, 2021). This is a figure which truly demonstrates that participation in Higher Education is a much different activity to how it was even 20 years ago. To add another level of complexity to the picture, in 1998 tuition fees of £1,000 per year were introduced, rising to £3,000 in 2004 and then £9,000 in 2014 (Anderson, 2016).

With the expansion of Higher Education and changing fee structure, it can be argued that the whole landscape of University Education has changed. It is sometimes argued that Higher Education has been "Commodified" (Wilkinson & Wilkinson, 2020; Woodall et al., 2014), with a multitude of students entering with the sole purpose of gaining graduate level employment on completion of their degree. This is a subject for a different debate, but it is certainly true that there is now a greater focus on employability as an important outcome of a University degree.

At this point, it is probably worthwhile asking specifically how Business and Management graduates fit into this altered landscape. Students of Business-related subjects are more "" tuned-in" to the idea of Higher Education as a route to higher

(level employment. They have chosen to study in an area which is highly related to a range of very recognisable careers (see Graduate Prospects list on page 64). Such students are keen to acquire a range of skills which they perceive will fit them more fully for the world of work.

Wilton states that:

"*In order to promote and justify the rapid and continued expansion of HE, particularly in vocational subject areas, two interconnected rationales have been espoused by: first, to service the high-skill labour requirements of a knowledge economy; and second, to increase opportunities in both education and, subsequently, employment for groups previously under-represented in HE*" (Wilton, 2011, p86).

This author goes on to describe Business and Management graduates as conforming to both of these rationales. Such graduates are (theoretically) developing the high-level skills fitting them to take their place in a knowledge economy and they have also been shown to come from demographic groups who have been traditionally under-represented. The mention of demographics here is interesting, but not part of the remit of this thesis. The use of the term knowledge economy, however, is very useful as it links with my discussion of Business and Management graduates as knowledge workers in 2.2.2.2. Cacciolatti et all add weight to the above by stating that Universities need to find their strategic position with regard to the radical technological change of the knowledge economy (Cacciolatti et al., 2017, p6), preparing students to take their place within this sphere.

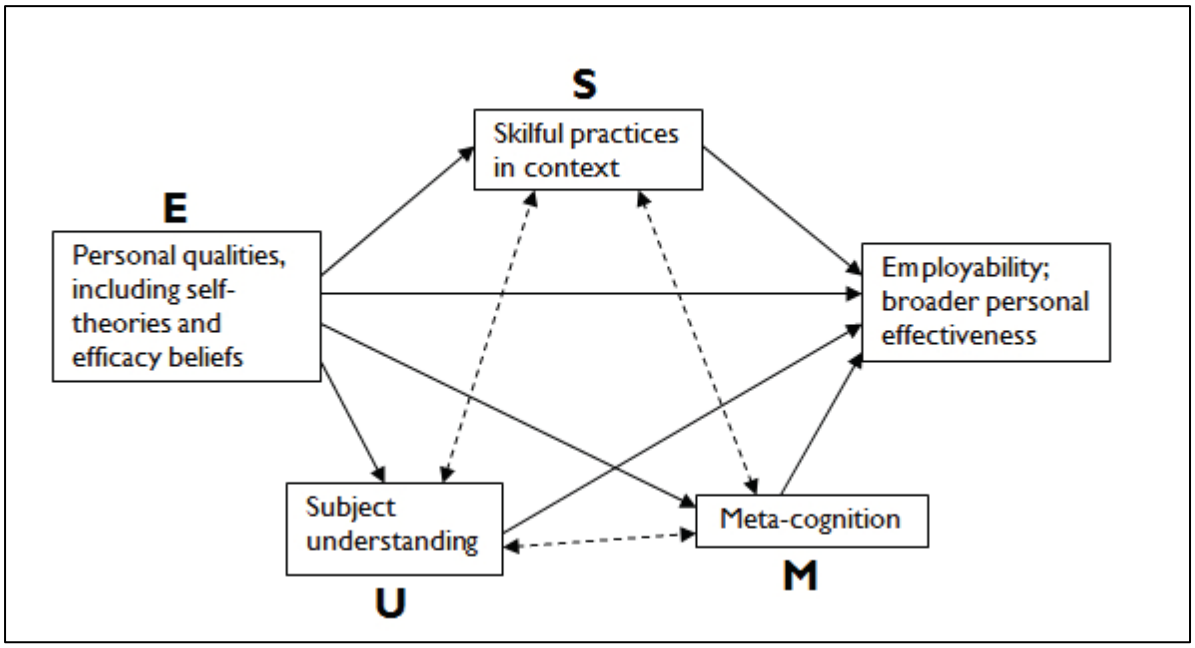
To conclude this introduction, we can define Business and Management graduates as the type of graduate, studying on the type of degree programme which is highly linked to the employment as a measurable outcome. It can be argued that it is the job of University Business Schools to help such graduates into appropriate employment. It is likely that equipping them with the right data literacy skills to function at a high level in business employment will allow them to confidently play a significant role in what has been defined as the knowledge economy.

2.3.2.2 Employability models

As employability grew in significance as an important part of undergraduate degree programmes, the definition of employability and the skills associated with becoming an employable graduate were subject to the development of a range of conceptual models. The aim of these models was to identify and evaluate the skills which are important and relevant for graduates as they seek employment at a suitable level. This section briefly explores the development of these models. They were developed a while ago, but they are generally considered to be the foundations of employability theory in the context of Higher Education. It is these models which informed the employability components of a range of educational standards explored in detail in Chapter 3 of this thesis.

One of the earliest models of graduate employability, the USEM model, was developed by Yorke in 2004 (Yorke, 2004). This model proposes four interrelated components of employability, as defined in Figure 2.5.

Figure 2.5 The USEM model



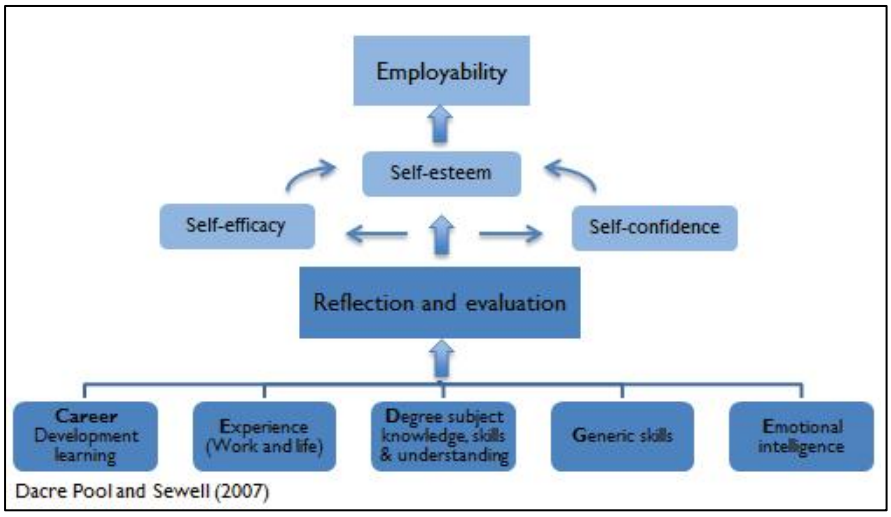
(Yorke, 2004)

The aim of this model is to provide a framework for embedding employability in the curriculum and is a useful approach in the context of the proposed research. In many organisations who employ Business graduates, the use of data management and analysis applications can be seen as skilful practices in context and can also provide

evidence of subject understanding, when such applications are used to interpret data as an aid to decision making. Confidence and skill in using such applications contribute a great deal to graduates perceptions of themselves and the contribution that they can make to the business, leading to broader personal effectiveness. Learning to use applications such as spreadsheets and databases to a high level is evidence of metacognition, as students develop problem-solving skills and strategies to apply techniques learned to their particular business situation.

Following on from the development of the USEM model, several related models were established, all concentrating on the incorporation of employability in the curriculum and including the requirements of students, employers and other stakeholders. The CareerEDGE model (Dacre Pool & Sewell, 2007), concentrated on the same broad areas as the USEM model, but attempted to make the whole concept of employability more understandable to students themselves, as well as academics. This model, like USEM was based on specific skills (at the bottom level of the diagram) leading to “softer” attributes which all contribute to employability.

Figure 2.6 CareerEdge Model



(Dacre, Pool and Sewell, 2007)

From the perspective of the proposed research, data literacy skills can be considered as quite firmly part of the “skills” part of the model, but as with the USEM model a confident grasp of data literacy tools can lead to self-confidence and self-esteem, when such confidence can be demonstrated in the business environment.

Universities uk

The next significant development regarding graduate employability was “Future fit – preparing graduates for the world of work”, (Universities UK and CBI, 2009) This publication demonstrated a further move away from an emphasis on skills towards graduate attributes and attitude.

It defines employability as:

“*A set of attributes, skills and knowledge that all labour market participants should possess to ensure they have the capability of being effective in the workplace – to the benefit of themselves, their employer and the wider economy*” (Universities UK and CBI, 2009). The report identifies the key aspects of employability as being:

Teamworking
Business and Customer Awareness
Problem solving
Communication and Literacy
Application of numeracy
Application of Information Technology

Adapted from Future fit, Preparing Graduates for the world of work (Universities UK and CBI, 2009)

According to this report, the above attributes should be underpinned by a positive attitude and an entrepreneurial/enterprise approach. It is clear from this range of attributes that the employable graduate should be a well-rounded individual coming into employment with more than just a set of relevant skills.

It is encouraging, from the perspective of the proposed research, to see Application of Information Technology listed alongside the “traditional” attributes of Literacy and Numeracy. However, it is likely that the further description of Information Technology as:

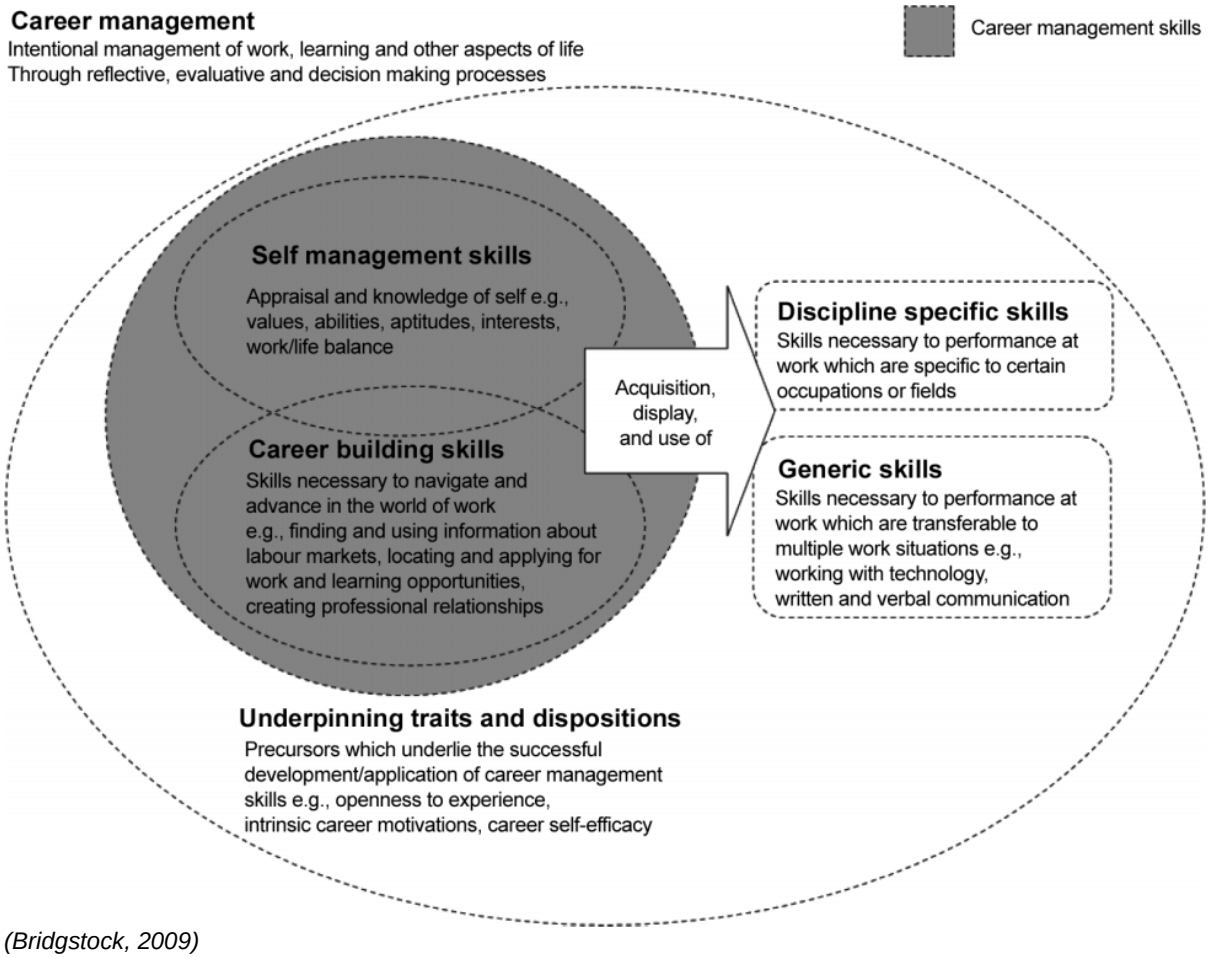
“*basic IT skills, including familiarity with word processing, spreadsheets, file management and use of internet search engines*.” (Universities UK and CBI, 2009) does not go far enough in the context of Business and Management graduates in the

modern business world. It is becoming evident that such graduates need to understand how to manage and interpret business data at a high level in order to participate fully in most graduate-level jobs and should demonstrate the characteristics loosely defined as those necessary for them to become knowledge workers. This goes beyond simply being familiar with spreadsheets.

Having said this, the Future fit approach has many strengths. One of its major recommendations, which runs throughout the report, is the emphasis on building employability into the curriculum and dedicating resources specifically towards developing employability skills and attributes. In terms of the teaching of data literacy skills, this has a direct application – it is important to build skills which can be understood and applied by students directly in the work environment. Importantly, it is also vital that graduates understand the value of data literacy tools and have confidence to apply them in “real world” work situations. In this context, data literacy skills have bearing on other attributes, particularly problem solving and also communication with others both within and without the organisation. Being able to understand the importance of business data and its interpretation can also lead to increased self-confidence in the workplace.

In 2009, Ruth Bridgstock also entered the Graduate employability debate with her paper examining “The Graduate Attributes we’ve overlooked” Her interpretation of the work already carried out with regard to graduate employability is that the identification of skills and attributes which contribute to employability is too narrow an approach. Instead, she contends that a career-management approach is more appropriate. (Bridgstock, 2009). This approach is represented in Figure 2.7.

Figure 2.7 The Career Management approach



(Bridgstock, 2009)

This approach identifies a range of skills which address the issues of self and career management. Again, these are mainly “soft” skills, concerned with personal attributes, both innate (abilities, aptitudes etc.) and learned (locating and applying for work, creating professional relationships etc.) There is little in this model which applies directly to specific skills, including data literacy. Within the context of the model “working with technology” is mentioned as a generic skill, but not explicitly defined. As mentioned previously, when looking at Business and Management graduates, it would be useful to define not only the types of applications with which they are skilled, but also the types of tasks they would be expected to use in the business environment. The possession of higher-level data analysis and interpretation skills would be a useful addition to this skill set, certainly with regard to Business and Management graduates.

The final work to be explored here regarding graduate employability is a document produced by the NUS in collaboration with the CBI in 2011, called "*Working towards your future: making the most of your time in Higher Education*". This is a detailed guide, aimed at students and it stresses the importance of developing employability skills in the modern, changing, challenging world (CBI/NUS, 2011). The guide identifies the same key attributes of an employable graduate as those identified in Future fit, with the addition of Self- management – one of the underpinning themes of Bridgstock's Career Management model. The guide also stresses the importance of a positive attitude as one of the most valuable items in the graduate toolkit when attempting to become more employable. In this, and in its overall tone, the guide again stresses soft skills and attributes as the most important features of an employable graduate.

The Application of Information Technology descriptor in this guide is stated as:

"*Basic IT skills, including familiarity with commonly used programmes*." (CBI/NUS, 2011)). With reference to the subject of data literacy, this again does not address the depth and complexity of tasks/applications which are necessary for Business and Management students to demonstrate employability skills in this area.

These models have been included here as they describe how general approaches to graduate employability have developed over time. The models laid down foundations for the aspects of employability that are an important part of most University Strategic Objectives, particularly the emphasis on embedding employability within the curriculum. Specifically, they underpin the rationale behind the HEA Employability framework:

"*HEA views embedding employability as providing the opportunities to develop knowledge, skills, experiences, behaviours, attributes, achievements and attitudes to enable graduates to make successful transitions and contributions, benefitting them, the economy and their communities*" (HEA Academy, 2016, p1) and also within the standards which inform the development of all Undergraduate Programmes by such bodies as QAA and AACSB (in respect of undergraduate Business Degrees). An examination of these standards will be carried out in the next chapter (Chapter 3).

The list of authors on the next page serves to identify key sources in the order in which they were used, in an attempt to summarise 2.3.2

“The summary of the authors on the next page identifies the key sources used in 2.3.2, in the order in which they were used.

Table 2.5 List of authors as they appear in Section 2.3.2

Author	**Contribution to section**
Wallace, S. (2015). Ro bbins Report (1963). In (2 ed.): Oxford University Press	Discussion of the Robbins Report of the Committee of Higher Education in 1963 which recommended an expansion in University provision
Melville, D. (1998). The future of higher education. *Perspectives: Policy and Practice in Higher Education, 2*(1), 8-13.	Illustration of the expansion of Universities over the 20th Century
Universities UK. Higher education in Numbers. Retrieved from https://www.universitiesuk.ac.uk/facts-and-stats/Pages/higher-education-data.aspx	Evidence of this expansion. There are now 194 Universities in the UK
Wilton, N. (2011). Do employability skills really matter in the UK graduate labour market?: The case of business and management graduates. *Work, employment and society, 25*(1), 85-100	Exploration of the implications for Business and Management graduates of the high-skill labour requirements of a knowledge economy.
Cacciolatti, L., Lee, S. H., & Molinero, C. M. (2017). Clashing institutional interests in skills between government and industry: An analysis of demand for technical and soft skills of graduates in the UK. *Technological forecasting & social change, 119*, 139-153	Building on the above. Universities need to address their strategies regarding the radical technological change of the knowledge economy.
Yorke, M. (2004). *Embedding employability into the curriculum*. York: York : Learning and Teaching Support Network	The USEM model of employability.
Dacre Pool, L., & Sewell, P. (2007). The key to employability: developing a practical model of graduate employability. *Education & training (London), 49*(4), 277-289.	The CareerEDGE model of Employability.

Universities UK and CBI. (2009). Future fit: Preparing graduates for the world of work. Retrieved from https://www.universitiesuk.ac.uk/policy-and-analysis/reports/Pages/future-fit-preparing-graduates-for-the-world-of-work.aspx	Development of the CareerEDGE model.
Bridgstock, R. (2009). The graduate attributes we've overlooked: enhancing graduate employability through career management skills. *Higher education research and development, 28*(1), 31-44	Development of a career management approach to graduate employability
CBI/NUS. (2011). Working towards your future: Making the most of your time in higher education. Retrieved from http://cced-complete.com/documentation/working_towards_your_future_eng.pdf	Aimed at students, emphasising the importance of developing employability skills in the complex modern world,
HEA Academy. (2016). Embedding employability in higher education. Retrieved from https://www.heacademy.ac.uk/system/files/downloads/embedding-employability-in-he.pdf	Statement reinforcing the importance of embedding employability in Higher Education and underpinning the current HEA Employability Framework.

2.4 Chapter summary and conclusions

The aim of this chapter was to establish a framework through which to address research objectives and also to develop some broad themes to inform the semi-structured interviews. This process is illustrated by the Research Roadmap which can be found in Chapter 4.

Specifically, literature was examined with a view to exploring the concept of data literacy from two perspectives, these being:

1. The development of what was termed “end-user computing” in the 1980s and 1990s when personal computing became a major feature of business, through to the modern day where personal computers are still a major part of most business jobs.
2. The ways in which current Business and Management graduates fit into this landscape as they enter employment, given the complexity of modern business technological tools and the associated emphasis on the management and interpretation of data.

2.4.1 Links to Research Objectives

The examination of literature around the area of end-user computing addressed Research Objective 1.” *To critically examine the concept of data literacy in the context of the employability of Business and Management graduates*” (see Chapter 1) by taking an historical perspective examining the great increase in importance of computer skills for employees in a range of jobs as personal computers became a fundamental part of business life. Moving into the 21st Century, data literacy skills are an extension of these business computing skills as technology improves and data becomes a major business focus.

Moving onto more contemporary literature examining the current technological age, identified as the “Information age” also allowed the consideration of Research Objective 1 continuing the exploration of the concept of data literacy. This also addressed Research Objective 2 “*To explore the views and opinions of employers, regarding the data literacy skills of graduates and how well these meet the requirements of their own organisations*” by examining the current complex technological landscape and the requirements of business within this landscape.

Moving onto the second set of literature examined, Research Objective 3 "*to explore student experiences, views and opinions on their own skills (or lack of such) in the area of data literacy)* was addressed by the examination of literature around Generation Z and the Digital Native. This literature provides a context within which to consider these views and opinions.

Literature focusing on the issue of graduate employability also addressed Research Objective 2 attempting to evaluate employability models and approaches against the data literacy skills deemed necessary for Business and Management graduate employment in current times.

Analysis of literature in the second part of the chapter is less detailed that that in the first part. This is because the issues of graduates, data literacy and employability are dealt with in depth within Chapter 4, in the context of the Business School response to the need for graduate data literacy skills. Chapter 4 provides context for the remaining Research Objectives, these being:

RO4: *To explore the views and opinions of Academic staff on student skills in this area.*

RO5: *To explore the views and opinions of both students and Academic staff as to the ways in which subjects which fit into the data literacy category are taught, in terms of both content and delivery*.

RO6: *To attempt a triangulation of the views and opinions of all three groups of stakeholders and to explore both common ground and differing perspectives between stakeholders.*

RO7: *To recommend ways in which Newcastle Business School can adapt existing curricula of data literacy subjects in order to align more closely with the requirements of employers and abilities of the students*.

2.4.2 Identification of gaps in Literature

2.4.2.1 Identification of employees previously defined as end-users

There is a robust body of literature from the end of the 20th Century regarding the subject of end-use computing. This identifies that this is a phenomenon which was subject to a great deal of consideration. Management of end-user computing was formalised with the development of Information Centres; training was considered to be of great importance and the relationship between end-users and central IS departments was discussed at length.

Nowadays, with less formalised structures in many businesses, the concept of end-user computing is not really considered. There is little identification of employees who would have been identified as end-users. The term “knowledge worker” is probably the closest description of this type of employee, but this is not an exact definition. What does this mean for those entering the increasingly complex technological world of business at this point? What skills are they expected to have and how are they expected to develop their skills? This is particularly relevant to new Business and Management graduates entering employment for the first time.

2.4.2.2 Technological skills of Digital Natives

The young people who fit this description, including current Business and Management graduates, are defined by the fact that technology is an intrinsic part of their lives because it has always been there. They are expected to be able to use computers and “gadgets” but there is little discussion in literature as to how this might translate into the use of business software or the development of data literacy skills.

In addition to this, it appears that Digital Natives are different to previous generations in a variety of ways. They prefer to multi-task and rely on being permanently connected to communication devices. They dislike passive learning. Given that these characteristics are generally associated with technology, there is little discussion about how they might affect the acquisition and development of data literacy skills, which could also be identified as another type of technological skill.

2.4.2.3 Theories of employability

The employability models which inform current strategies on embedding employability into the Higher Education curriculum do not address the importance of data literacy skills. Information technology skills are considered, but at a very basic level. Given that data is seen as such an important strategic asset and the management of data is considered to be a vital business skill, it could be said that the current approach to employability does not really meet the needs of Business and Management students.

To return to the subject of end-user computing, addressed at the beginning of this Literature Review, there is one other very important point with which it is useful to conclude this section. It has already been mentioned that the end-users of the 1980s and 1990s began to use desktop computers to assist them in a range of business functions. The important thing to note about this is that these employees were generally already proficient in these functions and used computers as additional tools. They developed their skills around the tasks that they were already used to doing. In terms of data, they were familiar with the data generated by and used within their particular functional area.

The Business and Management graduates of today are entering the business world without this functional knowledge. The technology they are presented with when they start work is also much more complicated, particularly with regard to the volume of data which is now in use. Therefore, in order for them to enter employment with an appropriate level of data literacy skill, this skill needs to be developed at University.

Chapter 3 will investigate Higher Education standards and frameworks, examining the extent to which this skill is addressed in the context of Business and Management graduates. This chapter will also undertake an analysis of data literacy modules offered at a selection of UK Business Schools with a view to identifying how well the need for data literacy skills are addressed from a pedagogical perspective.

Chapter 3 – Data Literacy teaching, Sectoral and Institutional Context

3.1 Introduction

Chapter 2 examined literature around the areas of data literacy in the workplace, Business and Management graduate characteristics and the importance of employability as an essential part of the Business and Management curriculum.

An historical perspective was taken initially in Chapter 2, focussing on how computers became universal tools for a wide range of business users with the development of PCs and associated software in the last part of the 20th Century. This was the beginning of the era of "end-user" computing where software tools were used by almost everyone in all types of job. This growth in end-user tools has continued to the present day and familiarity with these tools has become even more important within the business workplace. As the availability of data and the tools to manage and analyse it have grown rapidly over the last 20 years a good understanding of these tools is vital to graduates as they enter employment.

The second part of Chapter 2 dealt with the area of graduate employability, with specific reference to current Business and Management students and graduates. The characteristics of these graduates was explored here as well as an examination of the development of graduate employability models and the current emphasis on the embedding of employability skills within the undergraduate curriculum. Graduate characteristics and employability were both considered in the context of data literacy and its importance to Business and Management graduates at the current time.

Having established the importance of data literacy as a vital skill for Business and Management graduates, Chapter 3 will further investigate the issue of data literacy in the curriculum. This will be carried out via an examination of a selection of standards and frameworks concerned with Higher Education teaching, specifically in the area of data literacy in Business Schools in the UK. My aim in carrying out this examination is to evaluate how well these standards and frameworks actually inform the teaching of this subject in the context of graduate employability in this area.

Following on from this examination, an attempt will be made to assess the actual teaching of data literacy at undergraduate level in a selection of UK universities. This

assessment will be carried out against a summary of issues established from this evaluation of the sectoral context.

3.2 Data Literacy teaching - Sectoral Context

The starting point for my examination here is the reiteration of the importance of data literacy skills within the modern business world. 2.2 in Chapter 2 considers the importance of these skills from the perspective of business, highlighting the fact that business leaders believe these skills to be vital when hiring staff for a wide range of business roles

Accepting the validity of this opinion held by business leaders, my evaluation of the area of the teaching of data literacy subjects to Business and Management undergraduates in UK Business Schools will be carried out in the following ways:

An examination of a selection of standards and frameworks which inform Business School teaching and University teaching in general. This examination will lead to the establishment of some important principles to be considered in the design of data literacy teaching in line with the standards.

Standards and frameworks will be examined in this section (3.2). In section 3.3 I will continue with this examination, critically evaluating data literacy content of a range of undergraduate Business and Management degrees at several UK Universities. The purpose of this next step will be to evaluate how well the teaching of data literacy subjects on these degree Programmes fit with the principles established by the examination of literature in Chapter 2 and the investigation of standards and frameworks carried out in this chapter.

This exercise will help to inform my Primary data collection and analysis.

Over the last two decades, Higher Education has been subject to a great deal of scrutiny from a quality and standards perspective. Although intended to improve performance and outcomes across the sector this approach is not without its critics. For example, there is some concern that standards are too concerned with the idea of treating undergraduates as “customers” (Calma & Dickson-Deane, 2020) emphasising the transactional nature of modern Higher Education. Other concerns are around the perceived audit-based features of quality assurance within Higher

Education replacing previous “light-touch” institution-specific control systems (Hoecht, 2006, p542). This leads onto the idea that Higher Education quality standards are only useful if they demonstrate awareness of different organisational cultures within different institutions (Hodgkinson & Kelly, 2007). Observations are also made that institutions expend a great deal of effort ensuring that degree Programmes adhere to quality standards, but employers are much more concerned with league table positions (Morley & Aynsley, 2007).

It is possible that some of these perceived limitations of a Quality Assurance approach to Higher Education may have some bearing on my overall conclusions on the teaching of data literacy subjects to Business and Management students in UK Business Schools. However, from the point of view of this part of my thesis where I am attempting to evaluate how this particular subject area is taught, examining the details of a range of standards in a non-critical manner is a useful place to start. By doing this I am able to appreciate the origin of the design of modules and programmes related to the subject area, thus aiding me in my evaluation of how well Business Schools address the teaching of data literacy subjects and particularly how well they teach the subject in the context of its importance and relevant to Business.

I will begin my examination by engaging with standards and frameworks set out by educational and government bodies, starting with the Quality Assurance Agency for UK Higher Education (QAA). I will also examine the question of Business School accreditation, examining the part that formal accreditation has to play in the design of Business and Management modules and Programmes in the context of data literacy teaching. I will do this with reference to the Association to Advance Collegiate Schools of Business (AACSB). Finally, I will consider the UK Government Department of Education perspective with an examination of the core metrics associated with the Teaching Excellence Framework (TEF) to determine how these relate to data literacy teaching. I will deal with each of these three sets of standards and frameworks separately before coming to some general conclusions at the end.

For each of the three sets of standards, I will identify the sections of Standards documentation which I consider to be applicable to data literacy subjects. The purpose of this is to help me gain insight into the overall landscape of Business and Management education, and particularly data literacy teaching, in current times.

Engagement with the standards will also allow me to develop my definition of data literacy and thus address Research Objective 1 of this research.

Following on from this identification of relevant sections, I will examine how the various metrics, benchmarks and recommendations put forward in the Standards translate into the classroom. In doing this I will attempt an evaluation of how the subjects associated with data literacy might be dealt with in modules offered on Business and Management Programmes looking specifically at types of content and delivery. I will also attempt an evaluation of how these modules are associated with graduate employability.

I will then turn my attention to an examination of the content of a range of Business and Management degrees at several UK Business Schools, including those offered at my own institution, Newcastle Business School. By doing this, I will aim to identify any gaps within the "official" Standards and also between these standards and the content of actual Business and Management degree programmes available within UK Business Schools.

As well as reviewing the current Higher Education landscape from the perspective of data literacy and graduate employability this exercise will allow me to develop and refine themes already identified in the earlier parts of this thesis which will be further explored in my Primary research interviews. Development of these themes will help in the building of recommendations to practice which is the ultimate aim of this research.

3.2.1 Quality Assurance Agency for UK Higher Education (QAA)

The QAA define themselves on their website thus:

"We safeguard standards and improve the quality of UK higher education wherever it is delivered around the world. We check that students get the higher education they are entitled to expect." (QAA, 2019)

Using this definition, QAA have developed a set of subject specific benchmark standards under the following headings:

1. Introduction
2. Nature and Extent (of subject area)
3. Subject knowledge, understanding and skills
4. Teaching, learning and assessment
5. Benchmark standards

A Subject Benchmarks Standards document exists for all subjects and groups of subjects taught in UK Higher Education institutions; each document organised into the headings listed above. In this section, I will examine the Subject Benchmark Standards document relating to Business and Management.(QAA, 2019)

I will start with section 3 (Subject knowledge, understanding and skills) as this is where I believe that discussion of the skillset broadly defined as data literacy can be found. I will examine the standards in the context of data literacy as both a subject in itself and/or a subject which is embedded in a range of other subjects. I will then explore Sections 4 (Teaching, Learning and Assessment) in an attempt to review content a delivery of teaching in these areas.

To return to section 3 of the standards and the list of necessary attributes of Business and Management graduates, the following is identified as an element of knowledge and understanding:

"*Information systems and business intelligence: the development, management, application and implementation of information systems and their impact upon organisations*". (QAA, 2019a p6)

Under Skills and practice specific to Business and Management, the following two skills are also identified:

"*Research: the ability to analyse and evaluate a range of business data, sources of information and appropriate methodologies, which includes the need for strong digital literacy, and to use that research for evidence-based decision-making*" (QAA, 2019a p6)

and

"*Numeracy: the use of quantitative skills to manipulate data, evaluate, estimate and model business problems, functions and phenomena*" (QAA, 2019a p6)

This demonstrates that the standards do incorporate most of the elements of what is being defined here as data literacy, although the knowledge and skills described are not specifically defined as such. It is therefore interesting to note that these specific areas of knowledge and skills can be found in different parts of the QAA standards, implying that they are not necessarily considered to be related.

Within this part of the benchmark statement, mention is made of understanding of business intelligence and also digital literacy and numeracy skills. All of these have been addressed in Chapter 2 already. With regard to the latter two skills the point has been made that data literacy is neither of these skills, although it encompasses elements of both. Having said this, it appears that the definitions of knowledge and skills outlined by this standards document reinforce and add to the Universities UK definition of data literacy discussed in Chapter 1

Having briefly reviewed Section 3 (subject knowledge, understanding and skills) in the context of data literacy with regard to Business and Management students, I would now like to turn my attention to Section 4 (teaching, learning and assessment).

In terms of these areas, the subject Benchmark document recognises the breadth and diversity of Business and Management degrees and the subjects covered within them. Such degrees are generally a mix of practical and academic subjects, to a varying degree depending on the specific degree focus.

Given the breadth and variability of content in Business and Management degrees, it is not surprising that recommendations are also broad and generic, with the overriding principle that "*The teaching, learning and assessment strategy is appropriate to the specific nature of a course*" (QAA, 2019a p8). In terms of data literacy, it is the consideration of this specific nature which is particularly relevant to both the content and delivery of modules and Programmes associated with data literacy which I am addressing in this thesis.

Recognising this generic nature of Business and Management degrees, QAA lists a wide range of methods of teaching, these being:

- lectures
- seminars
- workshops
- field work
- work-based learning, including placements and internships
- employer or organisation-based case studies
- live or 'real world' projects
- guided learning
- study trips
- simulations
- practicals
- discussion groups
- virtual forums
- business mentoring
- business start-up (QAA, 2019a p8)

but do not recommend particular approaches to specific disciplines within the overall subject. In terms of my area of study this is not necessarily helpful. Most of the approaches listed above would have some relevance to the teaching of data literacy, but which ones to choose which will engage these particular students and give them an understanding of subjects associated with data and how important it is to Business?

In addition to this question, it is also important to consider how prepared Business Schools actually are in adopting some of the approaches detailed above. Trkman, amongst others is of the opinion that “despite major changes in the environment, the business models of business schools have not experienced much change. Methods of teaching and research remain similar to 30 years ago” (Trkman, 2019, p1). Specifically, with regard to employability David et al state comment on the scrutiny that business schools have come under regarding their ineffectiveness in developing graduates skills in line with employers requirements. (David et al., 2021) even though Business administration is considered as one of the most evolving fields of contemporary social science (Farashahi & Tajeddin, 2018) and surely, teaching in Business Schools should be evolving at the same rate.

To conclude, if we accept the two statements above, that Business School methods of teaching are likely to be outdated and that the field of Business Administration is evolving fast, it would be good to explore if the subject of data literacy could be used as a catalyst to exploit new teaching methods with a view to modernising Business

School teaching as a whole. We already know how important data literacy skills are in business and the growing reliance on data within all businesses. If new methods of teaching were to be adopted within the area of data literacy, in line with some of the methods on the QAA list it might serve to align Business School teaching with the needs of business in general. Fichman et al state that “it has become important for all business students to have a strong grounding in IT and digital innovation in order to manage, lead, and transform organizations that are increasingly dependent on digital innovation”(Fichman et al., 2014, p330). However, the same authors also go on to say that Information Systems education is “stuck in the past”.

In order to further examine the issues raised above, Research objective 5 of this thesis addresses the issue of Business School data literacy teaching:

“*To explore the views and opinions of both students and Academic staff as to the ways in which subjects which fit into the data literacy category are taught, in terms of both content and delivery*”

and Research objective 7 deals with recommendations for adaptation and improvement:

To recommend ways in which Newcastle Business School can adapt existing curricula of data literacy subjects in order to align more closely with the requirements of employers and abilities of the students

In order to provide evidence in support of these Research objectives and to further address issues raised above, 3.3 of this chapter will evaluate data literacy teaching within a selection of Business Schools in addition to the questions directed to all stakeholders as part of primary research questionnaires.

3.2.2 AACSB Business School Accreditation

This section will discuss the AACSB Accreditation standards, using the same structure as that used to examine the QAA Standards in 3.2.1, looking first at the standards themselves and then moving on to consider the standards in the context of teaching and learning, in both cases through the specific lens of data literacy.

AACSB define their overall mission on their website as:

"*to foster engagement, accelerate innovation, and amplify impact in business education. The mission informs AACSB accreditation standards for business schools. AACSB strives to continuously improve engagement among business, faculty, institutions, and learners, so that business education is aligned with business practice* (AACSB, 2020)

This fundamental mission is underpinned by a recognition that Business Schools must act to ensure that the education they provide takes account of the dynamic nature of business and the ever-changing needs of the business environment. From the perspective of data literacy, this is highly relevant, given the central role that management and understanding of data now plays within the skillset of business employees, in this environment of dynamic and rapid change.

The 9 AACSB Standards are structured around three main headings, these being:

1. Strategic Management and Innovation (Standards 1 to 3)
2. Learner Success (Standards 4 to 7)
3. Thought Leadership, Engagement and Societal Impact (Standards 8 and 9) (AACSB, 2020)

I am addressing these standards from the perspective of teaching and learning in the context of data literacy and Business and Management graduates. I will therefore concentrate on the second set of standards, these being Learner Success. I will evaluate the Learner success Standards with reference to their relevance to the area of data literacy, also referring back to the teaching and learning elements of the QAA Standards already explored in the 3.2.1.

The first Learner Success Standard (Standard 4) is concerned with the curriculum. This Standard contains a clear recognition of the fast-paced nature of change within the Business world, as discussed in the overall mission of AACSB. This is evidenced by the requirement that "*an accredited Business School provides curriculum content which is current, relevant and forward-looking*" within Standard 4.1 as well as "*fostering innovation, experiential learning, and a lifelong learning mindset within Standard 4.3*" (AACSB 2020, p37). Business Schools are judged to have met the requirements of this Standard when they reflect current and innovative business theories and practices, again building on the importance of teaching which is aligned

with the ways in which business currently operates. Within this basis for judgement which forms part of the accreditation process, Business Schools are expected to infuse current and emerging technologies throughout their degree Programmes and also ensure that "*a learn-to-learn expectation is instilled in learners to facilitate agility in adaptation to emerging technologies in the future*" (AACSB 2020 p39). It would appear that this is clear evidence that AACSB accreditation is significantly dependant on the recognition of the importance of undergraduate competence with a range of technologies. Implicit in this is those technologies associated with the use of data, given that we have already established the key role that data management and analysis skills play in the modern business environment.

The Learner Success Standards 5 and 6 are associated with Assurance of Learning and Learner Progression. These two standards are both more concerned with quality assurance around whole degree Programmes, and as such do not have specific relevance to the teaching of data literacy subjects. Although they are both extremely important in ensuring that degree Programmes as a whole are "fit-for purpose" they need to be discussed in detail here. Standard 7 however, which is concerned with Teaching Effectiveness and Impact has a clear relationship with the teaching of data literacy subjects, building on elements of the curriculum already discussed above. Again, this Standard reiterates the importance of teachers being able to deliver a curriculum which is current relevant and forward-looking. In order to achieve this, they should be current in their discipline and pedagogical methods, demonstrating a lifelong learning mindset. Successful teaching can be measured by learner satisfaction and outcomes.

All of the above can be related to the specific teaching of data literacy subjects. The requirement that teaching be current, relevant and forward-looking links to previous discussion of ensuring that undergraduate Business and Management teaching should be aligned closely with the requirements of business (one of these key requirements being a data literate workforce). Current in discipline and pedagogical methods would include employing a diverse range of teaching methods in order to engage students. Student engagement and subsequent achievement of learning outcomes is essential to ensure that graduates are able to take their skills into the

workplace. This is particularly relevant in the area of data literacy given the importance of a data literate workforce, as described above.

The AACSB Standards can be linked quite closely with the QAA Standards. Both sets of Standards recognise the importance of aligning the content of Business School undergraduate degrees with the constantly changing world of business, keeping content relevant to this changing world. QAA standards are more concerned with the detail of particular subject areas and data literacy can clearly be identified as a component part of these subject areas. AACSB is more concerned with a general philosophy of engagement, innovation and impact underpinning undergraduate Business and Management education. Again, this has great relevance in the area of data literacy. Fundamental to the AACSB philosophy is the understanding that undergraduates need to be able to rise to the challenges of a fast-changing environment, particularly with reference to emerging technologies. They also need to develop skills which allow them to adapt to these technologies as they evolve, taking a lifelong learning approach to this fast-changing world. Implicit in all of this, given the significance of data skills in business is the fact that much of this adaptability and ongoing skills development will be in relation to data skills.

To return to actual teaching content and methods, again QAA are much more concerned with the detail, listing a comprehensive set of teaching methods which can all theoretically be employed in undergraduate Business and Management modules and programmes. As stated previously, deciding which of these teaching approaches are appropriate to data literacy subjects is something to be seriously considered and is something I intend to address in my recommendations as a result of my Primary Research. AACSB also consider the importance of different teaching methods, engaging with this from the perspective of academic staff attributes. In line with the AACSB standards academic staff should be current in their discipline and pedagogical methods. The aligns with the list of teaching methods put forward by QAA, suggesting that there are a wide range of teaching methods available beyond the “traditional” approaches of lectures and seminars. Academic staff in Business Schools should be conversant with these methods and be able to select appropriate methods to suit the data literacy curriculum in a way which is both relevant to business and engaging to students. Following on from observations made at the end

of 3.2.1, one of the objectives of my research is to determine how far this is actually the case and how far it can be improved.

3.2.3 The Teaching Excellence Framework

The Teaching Excellence Framework (TEF) differs from the two other sets of Standards explored within this section. The section of the QAA Standards explored here and the Standards for AACSB accreditation are both specific to Business Schools, whereas the TEF applies University-wide. Having said this, it is still possible to examine the TEF through the lens of data literacy teaching in Business Schools in conjunction with the other two sets of Standards in order to come to some broad conclusions.

The TEF was introduced in October 2017 by the UK Department of Education which the purpose of:

- Better informing students' choices about what and where to study
- Raising esteem for teaching
- Recognising and rewarding excellent teaching
- Better meeting the needs of employers, business, industry and the professions (UK Department for Education, 2017, page 7)

The Framework is based upon three main assessment criteria, these being Teaching Quality, Learning Environment and Student Outcomes and Learning Gain. Providers applying for the TEF are awarded one of three possible ratings, Bronze, Silver or Gold.

The core metrics which are used to award ratings are largely based on centrally collected data from the NSS (National Student Survey), HESA (Higher Education Statistics Agency) and DLHE (Destinations of Leavers from Higher Education). In the context of this research, it is not necessary to explore these metrics. It is more interesting to examine the aspects of Quality as they are defined by the TEF to see how well they align with the previous two sets of Standards and how they can be applied to the data literacy curriculum.

Starting with the objective of Teaching Quality, there is an emphasis on Student Engagement and Rigour and Stretch, demonstrating recognition of the need to

engage students with their learning and also to develop courses which foster independence, knowledge and skills. Implicit in this is the recognition that undergraduates need to build a learning style which they can develop throughout their education and beyond. From a Business School and data literacy perspective this aligns with the QAA Benchmark standards which refer to specific business skills including modelling business problems and using evidence-based decision making. These are skills which can be learned as part of an undergraduate degree, but which can also be then used effectively during a career in business. This is also aligned with the AACSB requirement for undergraduates to develop a lifelong learning mindset.

The Learning Environment aspect of the TEF is concerned with ensuring that students have the resources available to enable them to attain their chosen goals and progress as far as they wish. Included in this aspect is the requirement that the learning environment is "enriched by student exposure to and involvement in provision at the forefront of scholarship, research and/or professional practice" (UK Department for Education, 2017, page 25). From the perspective of a Business and Management student the exposure to professional practice is critical, given the diverse and rapidly changing nature of the Business world, acknowledged by both QAA and AACSB. This is particularly true with regard to data literacy subjects as it is within the world of data management and analysis that much of the rapid movement occurs in Business.

The third aspect of the TEF addresses the issue of Student Outcomes and Learning Gain. This aspect, probably more than the other two has great bearing on the subject of this thesis, being concerned with the acquisition of skills and knowledge which are valued by employers, and which allow students to enhance their professional and personal lives in the future. Regarding Business and Management students and data literacy subjects this is highly relevant. The data literacy skills and knowledge acquired by students during a Business and Management degree should ensure that graduates are able to gain employment where these skills are necessary. As already expressed, this is likely to be most types of graduate business job. The ways in which these skills have been taught should allow graduates to develop these skills and learn new ones as the business requires. Again, this is in line with the specific

skills and requirements of the QAA Standards and the broader lifelong learning attributes referred to in the AACSB Standards.

3.2.4 Standards and Frameworks Summary

The brief review of the three Standards and Frameworks above has led to a conclusion that the main aspects which need to be addressed in the teaching of data literacy subjects on Business and Management undergraduate degrees are as follows:

1. Teaching needs to be current and Business relevant
2. Different teaching methods need to be explored, which build upon this currency and relevance
3. Students need to be engaged with the subject and to understand its importance
4. Students need to be taught skills which they can build on in the workplace as changes in technology and business practice occur.

The next section (3.3) will consider a range of Business and Management degrees offered by a selection of UK Business Schools with a view to assessing how well the above four aspects of data literacy teaching are dealt with by these institutions.

3.3 Data Literacy Teaching, Institutional context

As stated in the 3.2.4, this evaluation of data literacy degree Programme content will examine undergraduate modules containing data literacy content at nine Universities including Northumbria. I identified modules containing “data literacy content” as those modules which use spreadsheets as a vehicle to teach a variety of statistical and quantitative techniques, with content comparable to that taught on BM9400 (Business Analysis for Decision-Making at Newcastle Business School.

When considering which University degree courses to examine in the context of data literacy teaching, deciding on my approach to selecting Universities was the first task. I initially considered investigating Business and Management degrees at Universities in my home area of the North East of England, these being:

1. Northumbria
2. Newcastle
3. Sunderland
4. Durham
5. Teesside

This initially appeared to give me a good spread of University types with two Russell Group and three Post 1992 Universities, potentially offering different approaches to the subject of Business and Management.

I rejected this idea for the main reason that the contribution to practice that I intend this DBA thesis to make will initially be made in the context of my home institution, Newcastle Business School at Northumbria University. It therefore made more sense to me to consider institutions with some similarities to my home institution rather than looking for too much diversity of University type.

Remaining with the initial idea of five Universities including my own, I decided that an alternative approach would be to identify the position of Northumbria University within a recognised method of Higher Education ranking, specifically with regard to Business and Management teaching. I would then identify the two Universities above Northumbria and the two below and examine the data literacy content of their general Business and Management degree. Some of the options available to me were:

1. Times Higher Education rankings (https://www.timeshighereducation.com/world-university-rankings)
2. AACSB Undergraduate Business School Programme Rankings (https://bestbizschools.aacsb.edu/undergraduate/rankings)
3. Guardian League tables (https://www.theguardian.com/education/ng-interactive/2019/jun/07/university-league-tables-2020, https://www.theguardian.com/education/ng-interactive/2020/sep/05/the-best-uk-universities-2021-league-table

There are many more rankings available, but I feel that there is no need to explore all of them, given that the purpose of this exercise is simply to devise a method of identification of a small number of Universities who offer Business and Management Programmes.

Having identified the league tables I wished to explore, I rejected the Times Higher Education rankings because they did not allow me to filter in an appropriate way to identify the Programmes relevant to this research. Filtering by all UK Universities, the closest sub category by subject is Business and Economics. Filtering by New Young Universities does provide a category for Business and Management but does not display all the Programmes on offer by University within this category.

I also rejected the AACSB rankings. They do not allow filtering by country and also do not provide Business and Management as a category. The two closest options are Business Administration or General Business.

The Guardian league tables, however are much more interactive, providing a category called Business, Management and Marketing and also listing all Programmes available at each University, with an option to “drill down” and examine the content of each degree Programme. This would allow me to identify and evaluate the data literacy content within the Business and Management degrees offered by my selected Universities.

I started off with the Guardian League tables available for 2019, as this was then the most current table. At that time Northumbria was ranked at 84. Selecting five Universities with Northumbria in the middle and filtering by Business, Management and Marketing, resulting in Table 3.1:

Table 3.1 Initial selection of Business Schools (Guardian, 2019)

Table Position	**University**
82	Hertfordshire
83	Birmingham City
84	Northumbria
85	Royal Agricultural University
86	Manchester Metropolitan

It was essential that the Universities selected actually offered a relevant degree programme. In keeping with the objectives of this research, I was looking for a general programme, which I identified as being called either **Business Management** or **Business and Management**. On further investigation Royal Agricultural University did not fit this criterion as it does not offer one of these generalist degrees. Essex was therefore added instead (Table Position 81) so Table 3.2 was created.

Table 3.2 Second selection of Business Schools offering Business and Management degrees (Guardian, 2019)

Table Position	**University**
81	Essex
82	Hertfordshire
83	Birmingham City
84	Northumbria
86	Manchester Metropolitan

It was then necessary to examine the selected degrees is some detail. The purpose of this was to ensure that there was enough detail available for an evaluation to be made of the data literacy content of the degrees on offer. Specifically, it was necessary to see some detail of module content offered at one undergraduate level, as a minimum.

This exercise resulted in the exclusion of Hertfordshire, given lack of detailed module information. Hertfordshire were replaced with Anglia Ruskin (League table position 87).

The final five identified for further evaluation are represented in Table 3.3.

Table 3.3 Third selection of Business Schools offering data literacy modules (Guardian, 2019)

Table Position	**University**
81	Essex
83	Birmingham City
84	Northumbria
86	Manchester Metropolitan
87	Anglia Ruskin

During the time spent identifying appropriate Universities and Programmes to evaluate against Northumbria, on 4th September, 2020 the latest Guardian Higher Education League tables were published. In these tables, Northumbria was now ranked at position 27 overall (up from 47 last year) and at position 58 for Business, Management and Marketing. The publication of the new rankings plus Northumbria's move within the rankings now meant that Northumbria's immediate neighbours in the table were a completely different set of Universities.

I decided to deal with this by expanding the number of University Programmes I would examine in this exercise. This made sense because I was still able to include Northumbria as a reference point and evaluate Business and Management Programmes at a greater number of Universities, adding some more depth to my investigation. The Business Schools identified on the next page all offer modules which can be defined as containing data literacy content, so they were all eligible for inclusion.

The eight Universities identified can be seen in Table 3.4.

Table 3.4 Final selection of Business Schools offering data literacy modules (Guardian, 2020)

	2019 Position (Northumbria 84)	2020 Position (Northumbria 58)
Essex (University of Essex, 2020)	81	105
Birmingham City (Birmingham City University, 2020)	83	88
Manchester Metropolitan (Manchester Metropolitan University, 2020)	86	90
Anglia Ruskin (Anglia Ruskin University, 2020)	87	82
Royal Holloway (Royal Holloway University, 2020)	67	54
South Wales (University of South Wales, 2020)	94	56
Aberystwyth (Aberystwyth University, 2020)	16	59
Lincoln (University of Lincoln, 2020)	47	60

At this point I also decided to exclude Northumbria from my initial evaluation, examining the Northumbria Business Management Programme at the end of the exercise, once the rest of the evaluations were complete.

I took a three-step approach to the evaluations of data literacy content within general Business Management degrees at the identified Universities. These three steps are as follows:

Step 1 – Create a table (see Appendix 1) to identify the general degree at each University which would be used in my evaluation and modules at Levels 4, 5 and 6 which I considered had a significant amount of data literacy content. Teaching and Assessment methods were also added to this table as well as length of module.

Step 2 – Evaluation of each of the identified modules against the important aspects of data literacy education that I distilled from the sectoral context examination in 3.2 of this chapter (see Appendix 2)

Step 3 – Examination of other salient points which arose from the evaluation exercise which complete this critique of data literacy teaching at the selected Universities.

Evaluations carried out and detailed in Appendix 2 provide evidence that all of the Universities in my selection do offer at least one module which could be identified as either being broadly a data literacy module or containing an amount of data literacy content.

It is evident from the evaluation provided by this table that the Universities I selected deal with data literacy in a variety of ways, both in terms of the content of the modules and the ways in which they are delivered and assessed. There are some important points to address which point to a significant gap between the importance of data literacy to business (evidenced both by business leaders and by the various standards and frameworks discussed in 3.2) and the ways in which the subject is dealt with on Business and Management Programmes. These will be addressed in the next section.

3.3.1 Issues arising from data literacy content evaluation

3.3.1.1 Length of modules

It is interesting to note that all of the modules identified in the table are single Semester modules. Some of them are identified as such in the Module specifications. Others are not specified but are listed as 20 credit modules implying that this is the case. The module offered by Essex (Quantitative methods and Finance) is a full year module, but the second semester is purely concerned with Finance. Overall, it is perhaps surprising that a subject of such importance can be dealt with in 12 weeks.

3.3.1.2 Level of modules

No University in the selected group offers modules with substantial data literacy content at all Undergraduate levels. Table 3.5 identifies modules by level at all eight Universities.

Table 3.5 Data literacy content by undergraduate level

	Level 4	Level 5	Level 6
Essex	X	x	
Birmingham City	X		x
Manchester Metropolitan	X		
Anglia Ruskin	X		
Royal Holloway	X		x (optional module)
South Wales		X	
Aberystwyth	X		
Lincoln	X		

Again, it is perhaps surprising and disappointing that a subject which is so important to the business world is only covered in one academic year by half of the Universities I have selected. Also, that is most common to offer the module at Level 4, three years before the cohort enter employment. Only one University offers a core data literacy module at Level 6.

3.3.1.3 Module content

For the purposes of this evaluation, I have concentrated on two types of module content which I have designated as being data literacy. The first one of these is the quantitative methods/business statistics type of content. I have included this because it maps onto the content of the Business Analysis for Decision-Making module offered by Newcastle Business School at Northumbria. This type of content does align to a certain extent with the Universities UK definition of data literacy See Chapter 1, page 13 and also the Research and Numeracy strands of the QAA

Subject Benchmark document in section 3.2.1 of this chapter. Having said this, I am not convinced that the teaching of this kind of business statistics gives the whole picture with regards to data literacy. The word “data” does not appear in most of the module descriptions, instead the emphasis is on mathematical and numeracy skills. These do have their place within the definitions of data literacy, but they do not tell the whole story.

Some of the modules I have examined here are more theoretical and cover such subjects as E-business, Big Data and Digital Enterprise. Modules with this sort of content tend to be separate from the Business Statistics modules and are not skills-based. This is disappointing, given that the latter type of module is relevant to the current business workplace and could be explored by the use of some simple digital tools.

3.3.1.4 Student engagement with modules

Keeping the focus on the two different types of module, it is likely that students find modules around the statistical methods to be challenging. The phenomenon of student resistance to quantitative subjects is beginning to be documented in literature. Laugerman evidences this resistance with regard to business and management students in the context of statistics teaching, mentioning the high level of anxiety experienced by students with regard to statistics and quantitative understanding. (Laugerman & Saunders, 2019). Opstad reiterates that the statistical skills of many business students do not meet the expectations of their tutors in these fields, going on to confirm the importance of quantitative understanding in business and therefore the importance of attitudes towards statistics for undergraduates in business fields (Opstad, 2020). Howard and Warwick also highlight the prevalence of what they term as “mathematical anxiety” amongst undergraduate business students. In a study carried out at a UK Business School in 2016, of a sample of 330 new Business School students more than half express some degree of this anxiety which the authors believe leads to avoidance and lack of engagement with the subject (Howard & Warwick, 2016). These students may well have avoided mathematics for several years, due to their anxiety, which is possibly one of the reasons that they chose not to take the subject any further after school.

The difficulties that students often encounter with quantitative understanding is made specific in some of the module descriptions provided by the Business Schools examined in my sectoral analysis. For example, from the University of Essex: *"IMPORTANT: Some students find the maths and statistics to be challenging. This is normal. If you find the lectures to be difficult and perhaps moving too quickly, be sure to make use of the additional support available*" (University of Essex, 2020).

3.3.1.5 Use of innovative teaching

Apart from Birmingham City, none of the Universities claim to make use of innovative teaching methods in line with those listed in the QAA Subject Benchmark document. Instead, there is a reliance on traditional lectures, seminars and workshops. This is disappointing as teaching of data literacy subjects and tools associated with manipulation of large and complex data sets could be developed in an innovative manner. The QAA document details "live" projects real-life case studies and simulation as methods which could be effectively used to engage students and it is my opinion that this type of teaching would fit well with the data literacy agenda.

3.3.1.6 Links of modules to current business practice

As stated in 3.3.1.1 above, the modules which can be defined as having data literacy content are generally those designed around quantitative methods/business statistics. Descriptions of most of these modules do not explicitly mention current business practice, although using analysis tools to aid in problem-solving and business decision-making is implicit in all of them, in line with the QAA Benchmark Standard.

Manchester Metropolitan do mention the use of large, complex data sets and the importance of transforming data into meaningful information, but the module description is not clear as how much hands-on practice is included. Birmingham City refer to large, complex data sets and also the use of real-world data. This is encouraging in the context of discussion around the increasing complexity of data in Chapter 2 and also a recognition of the importance of the fostering of a lifelong learning approach in the fast moving and technologically complex world of Business described in the AACSB standards. It is perhaps disappointing that only one University out of those examined appears to offer a module which uses real-world data in a hands-on way, taking account of the volume and complexity of such data.

3.3.2 Data literacy teaching at Newcastle Business School

At this point I only intend to briefly discuss the above, as primary interviews will undoubtedly serve to provide a wealth of qualitative information from student and academic interviewees about the content and delivery of BM9400 (Business Analysis for Decision Making). This is the Level 4 module currently being taught at Newcastle Business School which I have classified as the data literacy module to be considered alongside those already offered by other Business Schools. In common with most of these other modules, BM9400 is a single semester module taught to Business and Management students at Level 4. It is a quantitative methods/ business statistics module with an emphasis on learning statistical techniques and interpreting results to inform business decisions. It does not use large data sets or recent real-world data. The structure of the module consists of one lecture and one IT workshop per week.

However, the whole suite of Business degree programmes on offer at Northumbria have been subject to a redesign exercise. This has included the creation of a new module at Level 4, BM9403, which will replace the current BM9400. The research carried out in this DBA thesis has made some contribution to the new module which now includes much more emphasis on business modelling, complex data sets and business reporting using techniques such as dashboarding. A full Module Descriptor document for this module can be found in Appendix 15. This Level 4 Module is part whole suite of modules which is being designed with the intention of building knowledge and skills in the areas of data management and analysis throughout all undergraduate levels from Level 3 through Level 6. Rigour and complexity have not been compromised and all modules will still include a large amount of analytical content. However, the focus of all the modules is to build skills over the course of a degree programme which are potentially transferable to graduate employment or further study. The Level 3 module of this suite has already been completed in Semester 1 of academic year 2020/21 and is used as a case study in Chapter 6 of this thesis to demonstrate an approach which will be replicated at all undergraduate levels going forward.

3.4 Chapter Summary

The purpose of this chapter was to examine the landscape of Business and Management teaching, in the specific context of data literacy. Assessment of

relevant standards and frameworks allowed for the development of an understanding of the main issues associated with data literacy in the undergraduate curriculum.

Following on from this, an evaluation of specific modules at a selection of Business Schools allowed these issues to be explored and gaps to be identified.

Both of these activities provide some really useful background to the collection of primary data, providing context for this research study. The next chapter, Chapter 4 will outline the construction of the research methodology and methods for the study.

Chapter 4 – Research Methodology and Methods

4.1 Introduction

As stated in previous chapters, this research is being carried out in order to examine one particular aspect of Higher Education in Business, that which has been broadly defined as data literacy. This examination is being undertaken with a view to making recommendations for the improvement of the ways in which this aspect of the curriculum is taught at undergraduate level in terms of both content and delivery.

Implicit in the focus of this research, is the recognition that such improvements would also have a beneficial effect for business in general (and particularly those businesses who employ graduates). It is important to be clear about this focus in this chapter, as it brings much to bear on the way in which the research will be approached. To refer back to the ultimate Research Objective outlined in Chapter 1 (Research Objective 7), the culmination of this study will be "to recommend ways in which Business School Academic staff can adapt existing curricula of data literacy subjects in order to align more closely with the requirements of employers and abilities of the students". This positions this thesis as a practical study with a practical objective providing useful recommendations to both academia and business.

4.1.1 Purpose of Chapter

The main purpose of this chapter is to explain and rationalise the approach which will be taken to conducting the original research. It will explain the philosophical standpoint to be taken to the research and how this standpoint will affect the data collection and analysis tools to be used. Overall, I have decided to take a qualitative approach to this study and the reasons for this will be fully explained and justified.

The chapter will also explain and justify the tools used for both data collection and analysis and will provide a clear rationale for the choice and use of these particular tools, with reference to the position of the researcher.

4.1.2 Structure of Chapter

As stated previously, this chapter will focus on explaining the overall rationale behind the research including data collection and analysis methods used in the study. In particular these methods will be discussed in the context of:

- a priori themes arising from the Literature Review, Sectoral and Institutional analyses
- philosophical underpinnings of the research with justification for these
- rationale for the selection of the actual tools themselves (semi-structured interviews and Template Analysis)
- concluding section which will lead into the next Chapter dealing with the results of the data analysis.

4.1.3 Link to research aim and Objectives

In order to fully understand the researcher standpoint and the tools selected for data collection and analysis referred to above, it is important to consider them in the context of the overall research aim and specific research objectives outlined in Chapter 1. As stated there, the overall research aim is to answer the following question.

"***Data Literacy Skills – why are they so important for graduates?"***

If, as a result of the research it appears that such graduates are not sufficiently proficient in these areas (as appears to be anecdotally the case) then:

***"What can Business Schools do to improve the current situation*?"**

The overall output of this research will be an attempt to answer the first part of the question and then make recommendations which will address the second part. In order to carry out an examination of the first part of the question, the following research objectives have been identified.

At this point each objective will be examined and a brief explanation will be provided as to how each one will be dealt with, within the research process. These Objectives have already been identified in Chapter 1 but will be considered in more depth here. This section will conclude with a graphical representation of the research process, the "*Research Roadmap*".

RO1: To fully explore the concept of data literacy in the context of the employability of Business and Management students.

In order to adequately address the overall research aims and subsequent research objectives, this exploration needs to be both clear and detailed. As the overall aim of the research is to identify the level of proficiency which graduates can demonstrate in the area of data literacy, full exploration of the term is essential. The foundation for the definition of what data literacy can be found in the 2015 Universities UK report, "Making the most of data: data skills training in British Universities" As previously mentioned in 1.7.4 this report introduces the concept of data literacy and describes it as "*Research design, data collection, data management, data analysis, modelling, interpretation and the presentation of research findings*" (Universities UK, 2015, p11)

This definition is introduced to all interview participants in an attempt at this examination and refinement.

The Literature Review of this study was the means by which I chose to investigate Research Objective 1. Easterby-Smith's definition of the Literature Review as a method of focusing the research process and allowing the author to conceptualise a broad field of study (Easterby-Smith, 2012) is true in the case of the research being carried out in this thesis. In fact, with respect to this study, the Literature Review served three main purposes. The first one of these was indeed to focus the research and to examine the concept of data literacy in the context of both employment and education, working towards a suitable definition from a Business and Management education perspective (conceptualising the broad field of study).

Secondly, the Literature Review was instrumental in constructing a set of broad a priori themes to be used as the basis for interview questions to all stakeholder groups.

Finally, the Literature Review was used to identify a range of gaps in existing literature and theoretical models which allowed me to further define interview questions. Exploration of these questions allowed for the development of some emergent sub themes which further added to the data analysis and conclusions.

The five themes which arose from the Literature Review are specified in Table 4.1 Gaps which were identified during the Literature Review process are also identified here. These gaps were identified in Chapter 1 but dealt with in more detail here. My aim is to explore these gaps in more detail during my interviews.

Themes and associated gaps are explored in this table. Following on from this, themes and gaps are synthesised with Research Objectives.

Table 4.1 Research themes and associated gaps in literature

	Description	**Identified gaps**
Theme 1	Data Literacy in the workplace. How the need for data skills in the business workplace has grown and developed since the invention of the Personal Computer in the late 1980s. Of particular interest here is the use of spreadsheet software.	There is a wealth of older literature around the growth of end-user computing and the use of spreadsheets in the latter part of the last century. There is very little more current examination of the use of spreadsheet tools in the business context. Previous experience of the researcher, backed up by Employer interviews carried out as part of this research actually points to the fact that spreadsheets are still used widely as a significant data analysis tool. If this is not recognised in the literature, it suggests that the use of such tools in business are not being critically examined by experts in the field of business data analysis. This is bound to have an effect on the skills which are being taught to undergraduates and the relevance of these skills to business. There is a wealth of current literature available on the subjects of Big Data and Business Intelligence. Both of these are associated with data literacy and as such, literature in these areas has been considered, but they do not really fit the context in which the skills taught to graduates are being examined by this research.
Theme 2	Graduate employability –theories, models and frameworks	Over the last ten years, Graduate employability has been much discussed, and a range of frameworks have been put forward in order to recommend ways in which Higher Education can align itself more closely with an Employability Agenda. In terms of the data literacy skills of Business graduates, these frameworks are not entirely appropriate, for the following reasons Many frameworks considered place a great deal of emphasis on “soft” skills. Where the use of computer software is mentioned, it tends to be at a very basic level For example, the Future Fit report identifies such skills as “basic IT skills, including familiarity with word processing, spreadsheets, file management and use of internet search engine.” (CBI & Universities UK, 2009). Where higher-level computer skills are mentioned, they tend to be related to Mathematics and Statistics or even computer Science graduates and refer to programming rather than data analysis and management skills. Even the Universities UK report (Making the most of data) which provides the initial definition for data literacy used in this research, positions the skill of data literacy within the domain of graduates who are going to take up a career in data analysis. There is little

		consideration of Business and Management graduates who are preparing to join the workforce in “general” business-related jobs. See list on p64.
Theme 3	Employer perceptions of graduates, specifically the current graduate generation, who have been labelled as Generation Z	The literature in the area of Generation Z focusses on the concept of the Digital Native and use of the Internet. The perception that current individuals in their early twenties are confident with “technology” and able to use “computer systems” is probably true in terms of the many applications and technologies associated with the Internet and Social Media. However, there is little research into how such individuals cope with the more structured environment of data analysis and data management. This is important when graduates enter employment. It is entirely possible that employers expect so-called “digital natives” to be proficient with spreadsheets and other data management and analysis tools. Anecdotally, they do not seem to have this proficiency.
Theme 4	Student perceptions of their own “technology” skills.	This is linked to the previous theme. Anecdotally, students are likely to agree that much is expected of them in terms of proficiency with “technology”. They are also likely to agree that they lack this proficiency in the context of data literacy. This leads them to feel anxious in University classes where they need to use spreadsheets and databases and they are often actively resistant to developing knowledge of these tools. There is very little in the literature which deals with this, certainly from the perspective of students and graduates. There is a body of work in the area of “computer anxiety”, but it refers mainly to older people in the workplace.
Theme 5	Curriculum content and delivery in the data literacy area	An examination of the literature surrounding University curricula in the area of data literacy aimed at Business and Management students reveals that much that is currently taught is concerned with Digital Business, Business Intelligence and Big Data (see Theme 1). Although these are important issues in the modern business world, there appears to be little examination of the data literacy aspect of Business education, at the level that is being explored in this research. It appears to this researcher that a fundamental understanding of the types of data management activity undertaken by the use of spreadsheets and other desktop tools provides an essential foundation for the understanding of such concepts as Big Data and Business Intelligence/.

RO2: To explore the views and opinions of employers, regarding the data literacy skills of graduates and how well these meet the requirements of their own organisations

As described above, Theme 1 was identified from the Literature Review as being concerned with data literacy in the workplace, beginning with a broadly historical perspective. This was a natural place to start, given my previous extensive experience with the use of data skills and tools in the business workplace. I felt it was appropriate to bring this experience to bear in respect of this initial stage of the Literature Review. In the words of Johnston “The starting point of the research process is determined by the position of the researcher” (Johnston, 2014, p208). I think my position within the field of my research has been made clear within the thesis up to no.

The taking of this initial position allowed me to further develop my approach to my exploration of Research Objective 2.

Research Objective 2 initially deals with the data literacy skills considered to be important to employers, as described above. The other critical aspect of this objective is concerned with the opinions that employers hold with regard to graduates and their actual level of skill within the area of data literacy. In addition to this, Theme 3 emerging from the Literature Review identifies some generalised characteristics of the present generation of graduates with respect to their use of technology. I am of the opinion that the current generation of graduates are indeed “digital natives” and it is evident that they are “the first generation to have no experience of life before the internet” (Prensky, 2001). However,, I am interested to explore whether or not the confidence and facility with technological tools brought about from this familiarity with the online world has a positive relationship with their level of data literacy skill. Anecdotally it would appear that this is not the case and there appears to be a significant gap in the literature within this area which could be addressed by this study.

By addressing this particular Research Objective and gaining the opinions of employers of Business and Management graduates it is hoped to extend and improve my own knowledge and add credence to my final recommendations.

RO3: To explore student experiences, views and opinions on their own skills (or lack of such) in respect of this area.

Research Objective 3 is concerned with the same general subject as Objective 2, the data literacy skills of graduates, but approaching it from a different perspective, that of the students who are currently being taught in Newcastle Business School at Level 4 and Level 6.

Theme 4 emerging from the literature review identifies that young people themselves display a confidence with technology in its most general terms, concurring with the concept of the "digital native". As with Objective 2, I am interested in the translating of this confidence into the data literacy arena. I am particularly interested in exploring this issue with two defined groups of students. The first of these groups are first year students who are currently being taught on the compulsory "Business Analysis for Decision-Making" module at Newcastle Business School. The skills taught on this module are those most closely associated with my own definition of data literacy. I am interested in how students feel they are able to perform on this module in terms of confidence, skill and ability to tackle the tasks which are set. I am also interested in the students' opinions of the content and delivery of the various components of the module and how this relates to their own skills development. The views and opinions of these Level 4 students are vital to this study. Within the current curriculum, this is the only module in which students engage to any extent with data literacy tools and techniques, at any stage of their Degree Programmes.

The second group of students under consideration with regard to this objective are Final Year students. These individuals will have either undertaken a Work Placement or continued straight on into Final Year. In terms of their opinions on their own data literacy skills, these are likely have been initially formed by their experience of the Business Analysis for Decision Making Module at Level 4. If they have been out on Placement, it is likely that they will have been exposed to an environment in which the use of data literacy skills has been necessary, and they will have needed to address their levels of skill again.

Exploration of these experiences should enable me to begin to formulate a picture of how undergraduates perceive their data literacy skills at points close to both the beginning and end of their studies. Regarding Final Year students, consideration will also be given to how they perceive their own readiness for employment and from a data literacy perspective. For those students who undertook a Placement it will also be interesting to examine how students felt about the need for use of these skills on Placement, and how confident they felt in their own abilities in this area.

Consideration of Research Objective 3 will enable me to further consolidate the picture of Business and Management graduates within the overall landscape of data literacy in the business workplace. This will build on the views and opinions of Employers. It will also allow for examination of the research gap identified in conjunction with Theme 4: Student perceptions of their own “technology” skills.

RO4: To explore the views and opinions of Academic staff on student skills in this area.

This Objective is concerned with the examination of student and graduate data literacy skills from the position of another group of significant stakeholders, these being the members of Academic staff who are responsible for the design and delivery of data literacy related modules. In the main, these will be staff who are part of the teaching team for the Level 4 module, Business Analysis for Decision Making, referred to under RO3.

I am particularly interested in obtaining the views of members of the Business Analysis for Decision Making team, with regard to the content and delivery of the Module as well as their perceptions of the actual data literacy skills of the students. I am also interested in their opinions as to how the Module fits into the whole Undergraduate offering made to Business and Management undergraduates.

Informal discussions between staff on this teaching team (of which I am one) reveal that most members of the team are of the opinion that most students struggle with this module. This is borne out by exam performance. Table 4.2 displays some key statistics calculated from exam results from semester 1 in academic year 2019/20. These are more representative than those from the current academic year, for the following reasons.

Due to the Covid-19 pandemic the last two iterations of the module have been online. A no-detriment policy which meant that students could elect to not sit the exam in semester 2 of academic year 2019/20 if they had sufficient credits from other modules. There were various technical difficulties in semester 1 of academic year 2020/21, due to the online nature of the examination.

Table 4.2 Marks Breakdown Level 4 Business Analysis for Decision Making module

Total Students	410
Total Submissions	286
Total Pass (40% and over)	207
% Pass rate	72%
Lowest Mark	0
Highest Mark	90
Average Mark	45
Breakdown	
Marks	**No. Students**
Below 40	79
41-50	106
51-60	49
61-70	30

Table 4.2 goes some way towards demonstrating how students cope with the BM9400 module. It is very telling that out of a cohort of 410 students, only 286 attended the exam, demonstrating a non-submission rate of 30%. The average mark of 45% is also very low in comparison to performance in other Level 4 modules.

To return to the discussion of content and delivery, anecdotally staff feel students find the content difficult to understand. The also struggle with understanding how the content might be applied in a business context. The mode of delivery (one lecture and one practical workshop per week for one semester) is intended to be inclusive and help students to learn at their own pace (particularly in workshops), but in practice staff find that students get “lost” early on in the module. They find it difficult to understand what is expected of them and experience the module as being extremely challenging.

Given the situation with regard to this particular module, examination of the views of staff are extremely useful to the research. Such examination, in conjunction with the views of students could help to identify the reasons why students find the subject so difficult and how this impacts on their own perceptions of their data literacy skills, and

possibly their ability to use data literacy tools and techniques when they enter employment.

RO5: To explore the views and opinions of both students and Academic staff as to the ways in which subjects which fit into the data literacy category are taught, in terms of both content and delivery.

This Research Objective will examine the opinions of all identified Stakeholders within the Business school, in an attempt to recognise similarities and differences. This will assist in the identification of additional emerging themes which will consolidate and enrich the a priori themes already identified from the literature.

This exercise will help with the establishment of a framework for the triangulation of all data collected from all stakeholder groups. See Research Objective 6

RO6: To attempt a triangulation of the views and opinions of all three groups of stakeholders and to explore both common ground and differing perspectives between stakeholders.

Research Objective 3 will be considered once all data has been collected from all stakeholder groups.

Careful consideration has been given to decision to collect data from multiple stakeholders. This data will be analysed by the use of Template Analysis. An important part of this analysis will be the triangulation of the views and opinions of all stakeholders. This will ensure that all themes identified as a priori have been adequately explored from all perspectives and that emerging themes have been allowed to develop.

There are several types of triangulation described in Research Methods literature. Carter defining four specific types, as described in Table 4.3.

Table 4.3 Types of triangulation

Method triangulation	Use of multiple methods of data collection about the same phenomenon.
Investigator Triangulation	Participation of two or more researchers in the same study
Theory Triangulation	Use of different theories to analyse and interpret data
Data Source Triangulation	The collection of data from different types of people – this can be done by either interview or focus group

adapted from Carter et al (2014)

The research being carried out in this study fits the description of Data Source Triangulation. Carter et al define this as triangulation that involves the collection of data from different types of people in order to gain multiple perspectives and validation of data (Carter et al., 2014).

The idea of multiple perspectives is extremely important to this study. All selected stakeholder groups (Employers, Students, Academic Staff) have a different approach to the issue of student and graduate data literacy, but the core themes around the issue remain the same. Triangulation of all of these perspectives allows me to develop a detailed thematic picture which is invaluable to the analysis of the data and the ultimate construction of recommendations.

RO7: To recommend ways in which the Business School Academic staff can adapt existing curricula of data literacy subjects in order to align more closely with the requirements of employers and abilities of the students.

Recommendations will be made in line with work done by Professor Philip Race and his “10 most important words in Learning, Teaching and Assessment” (Race, 13/03/2019).

Therefore, recommendations will be made by attempting to answer the questions posed in Table 4.4. These questions map quite conveniently onto the overall Research question.

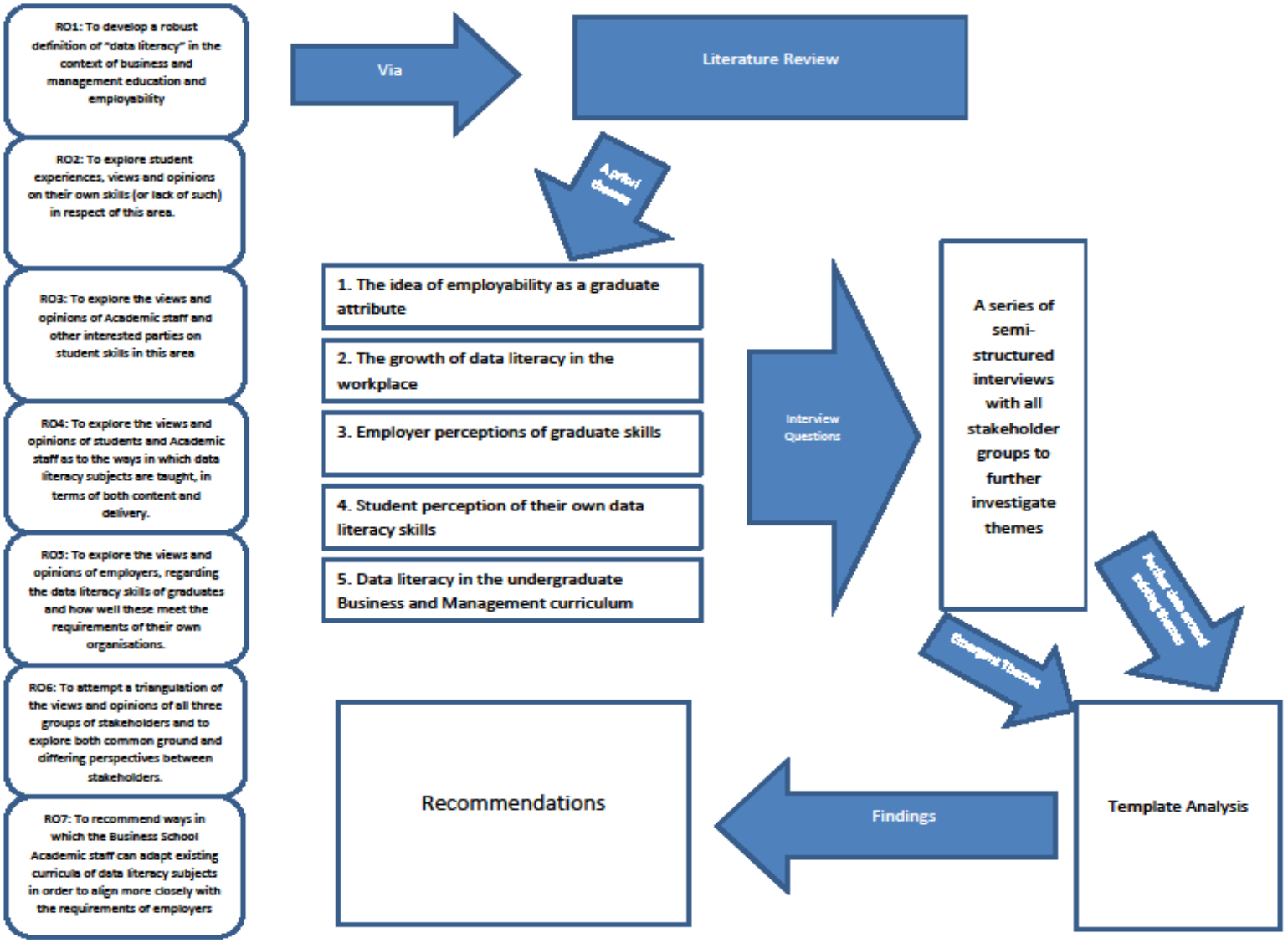
"***Data Literacy Skills – why are they so important for graduates? What can Business Schools do to improve the situation*?"**

Table 4.4 – Recommendation mapping (adapted from Race, 13/03/2019)

Why	…are students and graduates struggling with data literacy related subjects? It is hoped that this question can be answered by examination of the research themes and subsequent analysis of data collected from all stakeholders. This question will form the Introduction to the final Recommendations section.
What	…should the content of data literacy teaching material consist of? This will not be in the form of a definitive list but will provide pointers to the kind of topics and material which are relevant and understandable to Employers, students and teaching staff.
Who	..should teach the subject. What lecturer skillset and delivery styles are suitable to the subject?
Where	…should the learning take place? Are lectures and IT workshops still the best vehicle for teaching and learning in the data literacy arena, or should the Business School be looking at different approaches to the subject?
When	…should the learning take place? Is one module in First Year enough, or should the subject be dealt with throughout the undergraduate career?
How?	… should the learning be delivered? This is probably an amalgamation of all of the other questions and should provide the final and definitive recommendation.

The Research Roadmap (Figure 4.1) identifies the path which will be taken through the research process, and how the research objectives have been addressed through the Literature Review and the interviews, culminating in a set of relevant recommendations laid out in the format described above.

Figure 4.1 Research roadmap



4.2 Philosophical Position and principles

The purpose of this section is to outline my philosophical position regarding this study, given my position as described throughout this thesis and the previous part of this chapter. This will lead to a full description of the approaches to be taken to the study and will lead into a detailed explanation of the study design and the analysis methods to be used.

4.2.1 Researcher position

In Chapter 1 and also in the introduction to the current chapter, I have made it clear that I have many years of experience in the field of data management and analysis in business. I am in a somewhat unique position regarding this experience as I have chosen to move from my position of a self-employed consultant, into a Higher Education academic role, thus experiencing the phenomenon of data literacy from two sides. As has been described in previous chapters, this move between roles has inspired a genuine interest in how the teaching within my main area of expertise (data management and analysis) is taught to Business and Management students. This interest is particularly related to how well-prepared Business and Management graduates are in the area of data literacy when they enter employment. This interest is the main motivation behind the research carried out in this thesis.

When considering my position in terms of my move between roles and my experience gained in both, selection of an appropriate philosophical and associated methodological approach to the research is extremely important. Given the extensive knowledge that I possess within the field, it seems appropriate to adopt a qualitative approach for reasons outlined below.

At this point, it must be stated that the decision to adopt a qualitative approach was not taken lightly. Coming from a quantitative background, my natural position would have been to undertake a quantitative study and I initially considered collecting data via a questionnaire to be administered to the various Stakeholder groups.

My situation within the subject of this research made me reconsider a quantitative approach. My research questions originated from two main positions, both related to my own lived experience. The first one of these is the experience I gained from working within the world of data management and analysis over many years, starting

from the very early days of Personal Computers and associated data management software. The second is the “insider” position that I occupy within the domain of data analysis teaching. My situation in both of these positions means that I have a rich knowledge of the subject matter which I am able to bring to the research. From the perspective of the interviews, I was able to use this knowledge to construct a meaningful dialogue with my interviewees around the subject matter of the research. I took account of the growing body of research within Social Science disciplines, which takes the view that research interviews should be treated as situated interactions between two people (Lampropoulou & Myers, 2012). Such interactions are often constructed around the stance or position of the interviewer, but they should also allow the interviewee to establish their own stance. The establishment of a particular stance does not have a consistent definition but can be described broadly as expression of an attitude, evaluation, or judgment which illustrates a person’s point of view (Englebretson, 2007). From the perspective of this research and the interviews I conducted, I felt able to establish my own stance from my situation within the subject area, as previously described. I considered that my experience within the subject areas of business and data management would also allow me to conduct meaningful discussion in these areas. This could help interviewees to establish their own stance within the conversations. I was aware that this should not take the form of “leading” the interviewees but should instead give them the opportunity to consider their own stance and enter into a useful and meaningful interaction with me, helping me to understand their various perspectives in the context of the area of research. I felt that this allowed me to broaden and deepen my own understanding of this context. This aided in my analysis of the interviews and helped to inform my ultimate recommendations.

It is evident that from the above that it is of extreme importance to me that the interviews with all stakeholders allowed space for interviewees to establish their stance and communicate their own views and experiences. With semi-structured interviews, rather than a more formal approach, it is more likely that this communication will happen. Harrell and Bradley define the semi-structured interview as follows “*This kind of interview collects detailed information in a style that is somewhat conversational. Semi-structured interviews are often used when the researcher wants to delve deeply into a topic and to understand thoroughly the*

answers provided" (Harrell & Bradley, 2009, p27). This is very much the approach taken in my interviews with all stakeholders. The approach is underpinned by my breadth of knowledge within the research area. This allowed me to explore the subject matter with the interviewees in an appropriate amount of depth, resulting in the collection of useful qualitative data.

King describe this qualitative approach to research as a more questioning approach which takes account of reflexivity. The whole issue of reflexivity is key to this study. This author describes reflexivity as looking both "inwards" and "outwards", exploring the intersecting relationships between existing knowledge, our experience, research roles and the world around us (King, 2019). Tracy further defines reflexivity as careful consideration of the ways in which researchers are impacted by past experiences, points of view and roles as well as interpretations of the research scene (Tracy, 2013, p2). Both of these definitions complement the interests of the researcher by focusing on the part that the researcher themselves has to play in the study. In the case of this research, it is very likely that my own past experience and roles can serve to enrich the data collected from the research participants and provide a detailed picture of the landscape of graduate data literacy and employability. It is also useful to think about the "inwards" and "outwards" nature of this type of research. Data collected from employers involves looking outwards whilst that collected from students and academic staff involves looking inwards. Given my two roles (past and present) I am also able to look both inwards and outwards in an attempt to create a comprehensive picture.

Having decided to take a qualitative approach and recognising that reflexivity is key, it is useful to also consider the extent to which the I consider myself to be part of the same group as my research subjects. Reflexivity is often also considered to be a function of research which is carried out within a group to which the researcher also belongs, sharing the participants experience (Berger, 2015).

In the case of the research being carried out within this thesis, it can be argued that I am not part of the "researched" group in a true sense. As outlined in Chapter 1, the participants in this research are recruited from three distinct groups, these being, employers of Business and Management graduates, students within the discipline of Business and Management and academic staff teaching within this same discipline.

Although I am currently employed as an academic and am truly part of this one group, I am neither an employer of graduates or an undergraduate student. However, the main argument to be made for a reflexive approach to the research lies in the many years of experience that I have had in the field of data management and analysis. This is my world and forms a large part of my lived experience.

The various merits and demerits of researching within one's own domain is the subject of a certain amount of debate and the components of that debate are multifaceted. Put simply, this can be seen as another dimension of the "inside" and "outside" nature of qualitative research, with research been carried out within the researcher's own organisation positioned on the "inside" side of the debate with the researcher being cast in the role of "insider"

Research carried out within one's own organisation can be described as "insider" or work-based research. Fundamentally, this study can be described as work-based research to the extent that most of the Stakeholders are to be found in the researchers' place of work and final recommendations are to be made to that place of work. Work based research is affected by both "situatedness" and context. The former is concerned with the particular situation in which the research is being undertaken and the position of the researcher within it. The latter relates to the culture and structure of the work situation and the actions and thinking of colleagues within that situation (Costley, 2010).

To this extent I can be said to be conducting work-based research from the position of an insider researcher and the research will be taking into account both the situatedness and context of the Business School in which I am employed. There is, however, another aspect to the research, this being the inclusion of graduate employers and the business world outside the University in the study. My own position with regard to this aspect adds more context. My previous experience within the business world and the inclusion of graduate employers in the study sample means that I am able to approach the research from an additional dimension. This previous experience and extensive knowledge of data literacy tools and skills in the business workplace means that I could be described as a "double-insider", this being someone who is an insider in relation to both the research and also the interviewees (Adriansen & Madsen, 2009).

In the context of this study, I am indeed an insider with regard to the subject of my research, this being data literacy in the workplace, in addition to my insider role as an academic teaching in a Business School. These two dimensions of my experience can serve to classify me as a “double-insider”. This position should not be ignored when I am designing and carrying out interviews. Detailed knowledge of the subject being researched can add depth to interviews but the I need to be aware that I should not allow my knowledge of the subject area to influence my interviewees. I should not assume that my experience of the subject exactly corresponds to that of my interviewees and should ensure that they are able to articulate their own experiences and views.

4.2.2 Overall Philosophical position

In terms of the methods selected, I intend to take a Contextualist position. Broadly speaking this position is rooted in a Relativist ontology and Constructivist/Relativist epistemology. Easterby-Smith et al observe that a Relativist ontolological stance is concerned with consensus between different viewpoints in the pursuit of truth (Easterby-Smith, 2012). This is one of the reasons that this stance is appropriate to this research. Information will be collected from a range of stakeholders in an attempt to reach some consensus and consolidation of themes and inform recommendations in line with Research Objective 7 of the study.

This, however, is not the only reason why a Contextualist position is taken here. I have already made it clear that I believe very firmly that reflexivity is vital in this particular research and that the subjectivity of the researcher is integral to the whole process. Within contextualism, researcher subjectivity is seen as an important component of the research itself and with researcher influence within the qualitative interview is not being treated as a source of ‘bias’ which threatens to undermine the validity and reliability of results (King & Brookes, 2017). In the context of this study, the influence of the researcher is extremely important. The various themes surrounding data literacy and the teaching of this subject are an integral part of my past and current lived experience and serve to inform a large part of the study design.

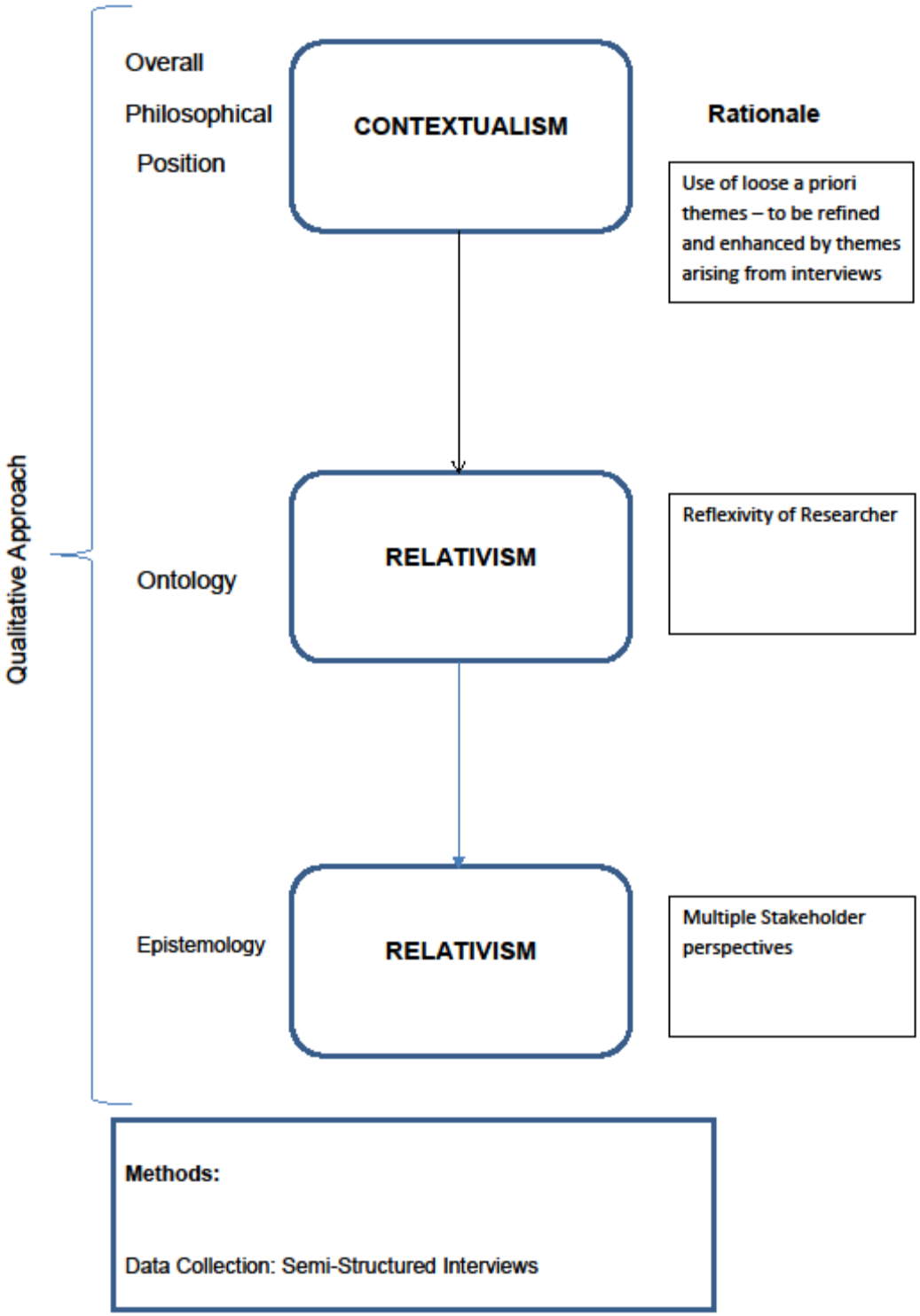
The other rationale behind the adoption of a Contextualist position is concerned with the development of research themes. A number of themes have emerged from the

Literature Review associated with the study. The identification of these themes and their development has been informed by both the literature and the previous work experience of the researcher. As such they can be considered to be a priori themes and I have used these in the development of interview questions for all participant groups. These themes can therefore be coded as part of the data analysis process. A number of sub themes have emerged from the interviews, and these can also be coded. When using Template Analysis from a Contextual position a priori themes tend to be broad and loose, with emergent themes also being taken into account. I am keen to enrich my data by working with both a priori and emergent themes, and the Contextualist position gives me the capacity to do this, without compromising the use of Template Analysis, as my preferred method.

In terms of a specific philosophical approach to this study, the approach which is most commonly used with Template Analysis from a Contextualist position is phenomenology. Phenomenology is based on the writing of four major philosophers (Husserl, Heidegger, Merleau-Ponty and Sartre) and can be described as the philosophical approach to the study of experience. In essence phenomenology is concerned with the examination and comprehension of lived experience (Smith, 2009) The “insider perspective” is also characteristic of the methodology of phenomenology (VanScoy & Evenstad, 2015, p339). I have made it clear within this chapter that my lived experience and that of my research participants is a driving force behind the study. I have also defined myself as an “insider within the context of this research. Acknowledging this, the question might be asked as to why I do not wish to approach the research in an entirely phenomenological manner, using an analysis tool such as IPA (Interpretative Phenomenological Analysis) instead of Template Analysis as my selected method. This is discussed more fully in 4.5.

Figure 4.2 serves to illustrate the overall philosophical approach described above, with rationalisation of its selection.

Figure 4.2 Philosophical position



4.3 Development of the Study Instruments

Previous sections have indicated that a qualitative approach is being taken to this study. Approaching the study from a Contextualist position, I am aware that the assorted context of people's lives becomes relevant data (King, 2019). The way in which this data is considered needs to allow for the assorted context and give the study participants enough space to articulate their own specific narrative. The collection of data in the form of this narrative should allow the researcher to create "thick descriptions" (Holliday, 2016) from participant accounts which will allow for the further identification and examination of themes arising from the research.

This leads to consideration of the way in which I might like to engage with research participants in order to capture this type of data. For several reasons, semi-structured interviews appear to be the best method. Galleta makes the point that such interviews allow the researcher to "prompt the participant, rephrase questions and make changes according to the situation" (Galletta, 2013, p75). This author describes this type of interaction as "the researcher as instrument", suggesting that the researcher is an integral part of the research process and cannot be divorced from it. This integrates very well with the Contextualist position that I have taken. Reflexivity is key to this position and the reflexive nature of the researcher's relationship to the study has already been stated several times. Further examination of the of the semi-structured interview leads to Kvale's analysis of such interviews as being neither a free conversation nor a highly structured questionnaire instead being orientated by theme rather than person with two people talking together about a theme, which is interesting to and important to both persons (Kvale, 1983).

This definition fits the study well. I am taking my interest in graduate data literacy further by speaking to others who are also interested, from several different perspectives.

In addition to the above, semi-structured interviews are also a good instrument for a study of this nature as they allow for additional themes to emerge. If I can allow for the rephrasing of questions and changes in direction, it is likely that more rich data can be collected, which can in turn lead to the emergence of these additional

themes. My prior experience and the “insider” nature of the research means that I can be confident in exploring these themes as they emerge, being able to identify when the conversation is generating valuable data and when it is not.

For the reasons outlined above, it was therefore decided that semi-structured interviews would be the instrument selected to collect data in this study. I then turned my attention to the actual design of the interview questions.

In order to conform to the Contextualist approach and its associated emphasis on reflexivity and loose a priori themes, I considered the design of interview questions very carefully. I was able to consider my own previous position as a freelance consultant and also my current role as a Business School lecturer to devise questions which I felt that my selected participants would be able to understand. As I planned to interview employers from a general business background and also students studying on generalist Business and Management programmes, it was important that I did not ask “technical” questions using any sort of Information Technology or Data Management terminology. It is likely that the third group of stakeholders, other academic staff, may well have understood such terminology, but parity of questions were very important to the study from the triangulation perspective.

Given that a priori themes arising from literature are also critical to this research I decided that the best way of starting the interview process was to link questions to these themes. Appendices 9, 10 and 11 contain three tables which set out the interview questions for each Stakeholder group and how each of the questions is linked to these priori themes.

4.4 Participant Selection

As previously mentioned, the multiple stakeholder viewpoints are critical to this research. Having given due consideration to the instrument to be used to collect data in the best possible manner from these stakeholders, it was then necessary to consider the selection and recruitment of participants from the stakeholder groups.

For clarity, each group will be dealt with separately.

4.4.1 Employers

It was decided to deal with employer interviews first. The rationale for this was that I felt that themes might emerge from the employer interviews which could usefully add to the interview questions offered to the other Stakeholder groups. Employers are the people with the views and opinions regarding the specifics of data literacy skills in business and as such can be seen to be the ultimate beneficiaries of the research.

Before commencing the recruitment process for employer interviewees, I decided to conduct a preliminary pilot interview with someone who I felt could offer valuable insight into both the questions and the interview process. This individual is the Chief Librarian at a local, large Public Library. She is known to me as a participant on several data management training courses that I organised during a previous work project. In her current job role, she is also responsible for the recruitment and supervision of graduate employees. She was not considered as a candidate for the full study as she is not involved in any way with Business and Management graduates.

The pilot interviewee was very positive about the interview and felt that the questions were relevant and generally straightforward to answer. As part of the interview, a conversation arose about the use of the phrase “Knowledge Worker”. This is a familiar term in business literature, as mentioned in Chapter 2 and is also often used in the Library Service. The conversation led to further development of the interview questions, to include a question about the term which was then asked to all participants in all stakeholder groups.

Following on from the pilot interview, it was decided that the questions were sufficiently robust and straightforward to be offered to a wider audience, so I set about recruiting employer participants. Initially, it was thought that the best way to approach this was to consider the employers who were likely to have recruited graduates from the Newcastle Business School. To this end, I examined the most recent HESA (Higher Education Statistics Agency) Destination of Leavers data for the North East. The rationale behind this was to examine the types of employers who recruit Business and Management graduates, with a view to targeting representative organisations. In practice, the types of employers who recruit Business and

Management graduates were extremely varied by both size and sector, so it was decided that this would not be an appropriate approach.

King makes the point that the criterion most commonly proposed for sampling in qualitative studies is diversity (King, 2019). To a certain extent, the participants in this study meet this criterion because of the multiple stakeholder perspective. However, diversity within stakeholder groups is also useful, so it was decided to try and achieve this, rather than to try and map interviewee characteristics onto available graduate statistics. I decided to examine the data already held by the Business School, within their contact database. This database holds details of organisations who have offered placement opportunities to students or have had involvement with the Business School through a variety of other means. There are 330 organisations on this database, with 130 of these being located in the North East. Fortuitously, from a diversity perspective the organisations in the North East were very diverse in terms of both size and sector. As this study is concentrating on the North East, it was decided to email the contact names within this area, requesting an interview. A copy of this email can be found in Appendix 4.

After a certain amount of email exchange (sometimes the contact name on the database was incorrect or the contact person felt that someone else might be more appropriate) I was able to secure thirteen interviews with different organisations. The diversity of the whole group was mirrored by the diversity of the organisations who eventually participated, so it was felt to be a very useful exercise.

In terms of number of interviews, it is also felt that this selection of employers meant that data saturation was achieved. Several authors, including Fusch and Ness agree that the concept of data saturation varies from study to study (P. I. Fusch & L. R. Ness, 2015) and that there is no “one-size-fits all”. General principles and concepts are agreed, these being that saturation has been achieved when there is no new data, no new themes, no new coding and ability to replicate the study (Dibley, 2011). Reaching a certain number of interviews does not necessarily mean that saturation has also been reached. Dibley defines data saturation as data which is both “rich” and “thick”. Rich data is quality and thick data is quantity. Both of these terms have been used throughout this chapter to describe the ideal data to be captured in this study. It is my opinion that the data that was collected from

employers was both rich and thick as well as fulfilling the other criteria around data, themes, coding and replication. It was therefore decided that thirteen was a good number of interviews, and this was the number aimed at for both sets of student interviews. This number was of course, subject to revision, if the student interviews developed in a substantially different way from those of the employers.

4.4.2 Level 6 Student Interviews

Having decided to aim for around thirteen interviews, the strategy for recruitment of Level 6 students was examined. Diversity was again considered to be important, and it was decided that the most diversity would be around whether or not students had been out on work placement or if they had simply continued straight into Final Year. This question would be asked to all students when they were invited for interview so that I could monitor how many students fitted into each category.

The next task was to decide which students to invite for interview. One strategy may have been to contact all Level 6 Business and Management students with an invitation. However, it was felt that this would probably not elicit a substantial response, given that the students would not know me personally and would have no incentive to participate. King acknowledges the difficulties with recruiting participants and mentions the roles of “gatekeepers” and “insiders” as facilitators to accessing interviewees (King, 2019). Gatekeepers are people who can grant access to particular groups of people and insiders are those who can identify potential participants. As Programme Leader for Business with Management, I could actually identify myself as both a gatekeeper and an insider, with access in both ways to the students on my Programme. As Business with Management is the most generic of the Business Programmes on offer at Newcastle Business school, students on that Programme also completely fulfil the profile of the type of students I might want to interview.

It was therefore decided that I would email all 65 Level 6 Business with Management students, inviting them for interview. Appendix 5 contains this email invitation. As an added incentive, I offered a £10 Amazon voucher to all students who completed an interview.

In contrast with the employers, student responses were very slow. Even the Amazon voucher did not seem to provide the desired incentive. In an attempt to recruit more students, I began speaking to colleagues in order to identify student contacts of theirs who may be willing to participate. One colleague was able to provide details of one particular student and that student then recruited several others. These were all Business Management students, so they still fitted the generic criteria. Again, this is an example of an “insider” contact providing access to participants. Overall, I managed to recruit thirteen Level 6 student participants. As with the employer interviews, by the end of the Level 6 student interviews I was confident that I had achieved data saturation as defined in 4.4.1.

4.4.3 Level 4 Student Interviews

In line with the strategy employed for the collection of Level 6 Student data, I decided to aim for around thirteen Level 4 student interviews, if data saturation had been achieved by this point.

It was much harder to persuade Level 4 students to participate in interviews. I did this by asking for volunteers from the three groups of students I taught on the BM9400 module in Semester 1 of academic year 2019/20. I then emailed those who expressed interest. I eventually managed to recruit 10 students, but this involved repeated invitations issued to the groups of students I had taught in semester 1 and also the Level 4 students on my Business with Management Programme. I also set up three interviews with students who failed to attend. Two rearranged, but one made no further contact with me. The email invitation to Level 4 students can be found in Appendix 6. I successfully interviewed 10 Level 4 students and I was confident that data saturation had been achieved by this point.

4.4.4 Academic Staff Interviews

There are only five staff teaching on the Business analysis for Decision Making module, so the number of potential participants is obviously much smaller. I managed to secure interviews with three of these members of staff by asking them directly face-to-face. Consideration of data collected from these participants will be given alongside the data collected from students in line with Research Objective 4 and the stated requirement to collect data which is both rich and thick.

4.5 Data analysis considerations

Once I decided to use semi-structured interviews as my data collection method, it was necessary for me to decide on an appropriate data analysis method. Returning to observations made in 4.5.1, I stated I was drawn to the use of a phenomenological approach. This fitted with my idea of the development of conversations with my interviewees, taking into consideration both of our stances with regard to the research area. Consideration of literature in the area of Phenomenology led me to reflect on the whole issue of my situation within my chosen field of research in some depth. I was particularly drawn to the idea of the primacy of the situated viewpoint:

"*all my knowledge of the world, even my scientific knowledge, is gained from my own particular point of view, or from some experience of the world without which the symbols of science would be meaningless*" (Merleau-Ponty, 1976) quoted in (Smith, 2009, p18)

Merleau-Ponty also considers how we perceive others, from our own embodied perspective, referring to the difference in perception of lived experience between ourselves and others "For him these situations are lived through, for me they are displayed" (Merleau-Ponty, 1976, p414-415)

Throughout this thesis I have consistently returned to my own lived experience in the context of my subject, approaching all aspects of the research from my own "situated viewpoint" This led me to the view that a phenomenological approach would allow me to conduct authentic conversation-style interviews, bringing my existing experience around the subject area to the process. Such interviews would also allow me to record the lived experience of others as they were displayed in the interviews to a level that I would be able to interpret and analyse results in a way that would aid my ultimate recommendations. Further reading led me to the consideration of IPA (Interpretative Phenomenology analysis) as a suitable method, given its roots in the detailed examination of human lived experience and reflection upon personal experience (Smith, 2009).

4.5.1 Thematic analysis

Given the above, and while considering methods for the analysis of qualitative data, it became clear very quickly that the development of themes is the most appropriate

method of classifying qualitative data. Thematic analysis (TA) is a method for identifying, analysing, and interpreting patterns of meaning (‘themes”) (Clarke & Braun, 2017, p297). Given the “conversational” nature of my interviews and the richness of data that I was expecting to collect, it was clear that development of themes would allow me to carry out appropriate analysis of my data. My decision to adopt a phenomenological approach fitted well with this thematic approach, linking to my overall methodology and loose interview structure.

It was at this point that it became clear that, whilst all the above is true, I was going to have to consider my thematic development more closely. As stated previously, my initial approach to this research is very firmly rooted in the depth of my experience within the research field (both in terms of data literacy in business and also teaching in this area at Undergraduate level for several years). This experience was the driving force for the development of my Research Questions and also my Literature Review. I am extremely committed to the focus that this development brought to the research and as such I consider that the Research questions and the issues that arose from the Literature Review are an integral part of this research, serving to enrich the data collected through interviews. As such, the interviews were built around a set of a priori themes which I was extremely committed to preserving. I realised that this commitment would prove problematic to the use of a phenomenological approach such as IPA. This approach is designed around the concept of emergent themes, rather than themes being constructed in advance, so it was necessary to consider another approach. I was still convinced that a phenomenological perspective was appropriate for my data analysis, but I needed to seek out an approach which was more inclusive of a priori themes. I therefore decided to explore the use of Template Analysis. According to Waring and Wainwright, this approach is less prescriptive than IPA around the issue of a priori themes, although it allows for a similar approach to the coding and analysis of data (Waring & Wainwright, 2008). King and Brooks also state that a priori themes are usually identified when a researcher has a definite focus on a particular aspect of the phenomena under investigation (King & Brooks, 2017). This is very relevant to the work being carried out here. I am focusing on a very specific set of graduate attributes which I have identified as data literacy and I am examining these attributes through the specific lens of employability. The development of a priori themes is a

natural consequence of this focus. Coupled with my prior experience and situation within the world of business education, these themes have provided me with a very useful interview guide, which in turn facilitates the creation of initial coding structures for my data analysis. Template Analysis provides me with the flexibility to create and develop these initial structures, starting with my a priori themes.

4.5.2 A priori themes

As a final consideration and justification of my approach to the analysis of my data, I would like to briefly discuss the role of the a priori themes discussed above, specifically the way in which I identify the term in the context of this research.

It is important to state here, that I am perhaps not using the term “a priori” in its true sense. Kant said that *a priori* knowledge is “knowledge that is absolutely independent of all experience” (Kant 1787). Adhering to this principle means that research dependant on a priori knowledge needs to be empirical in nature, totally testable and justifiable. This would appear to be the complete opposite of the qualitative, phenomenological research that I am carrying out here, using my own existing knowledge, experience and beliefs as a starting point. Having accepted this traditional definition of a priori, I am prepared to continue to defend the use of a modified version of the term in this research. Wallace argues that it is nearly impossible to have knowledge which is totally independent of all experience. He modifies the definition to be *independent of experience* beyond that which is needed to acquire the relevant concepts needed to understand those propositions Wallace (2014), cited in (Kooy, 2015). I would agree with this, in the context of my research. I have knowledge of the relevant concepts that I want to explore, and it is this knowledge which enables me to develop my initial themes, allowing me to understand the propositions set out by in my research questions.

Following on from this, I would like to briefly clarify my understanding of a priori in the context of this research. King and Brooks define a priori themes as simply being those that are identified in advance of coding. They also make the point that to use Template Analysis successfully, it is better for such themes to be tentative, loose and soft, rather than hard and prescriptive. (King & Brooks, 2017). The researcher should also be prepared (and even expect) to modify the themes as the analysis takes

place. I believe that my identified themes satisfy these criteria, so I am satisfied that this is an appropriate method to use.

4.6 Research Ethics

(Bell & Bryman, 2007) identified 10 principles of ethical practice, outlined in Table 4.5.

Table 4.5 10 principles of ethical practice

1	Ensuring that *no harm* comes to participants
2	Respecting the *dignity* of research participants
3	Ensuring a fully *informed consent* of research participants
4	Protecting the *privacy* of research subjects
5	Ensuring the *confidentiality* of research data
6	Protecting the *anonymity* of individuals or organisations
7	*Avoiding deception* about the nature or aims of the research
8	Declaration of affiliations, funding sources and *conflicts of interest*
9	*Honesty and transparency* in communicating about the research
10	Avoidance of and *misleading* or false reporting of research findings.

(Bell & Bryman, 2007) adapted from (Easterby-Smith, 2012)

These principles will be adhered to in the proposed research, which will also be carried out in accordance with University Ethical Guidelines.

" Ethical approval must be obtained for all research projects prior to the commencement of the research" (Northumbria University, 2020)

This statement from the Northumbria University Ethics and Governance web page which is supported by both central and Faculty based Ethics Committees, underpins the whole ethical process required of researchers within Northumbria University. In order to obtain ethical approval to conduct research, it is necessary to submit an on-line ethical approval form.

Within the guidelines of this form, this Research is concerned to be in the "medium" category of risk in that it relates to:

- Nonvulnerable adults
- Nonsensitive personal data referring to a living individual

This level of risk necessitates that individuals interviewed need to sign a Faculty Individual Informed Consent Form. Two copies of this form are required, one for the participant and one to be retained by myself. A copy of the form created in respect of this study can be found in Appendix 8 as well as a supporting sheet created by myself which explains the context of the Research in more detail (Appendix 12).

Ethical approval for this study was applied for and granted in June 2018, (application no. 9679). A copy of the approval email can be found in Appendix 7. A copy of the Individual consent form which was given to all interviewees can be found in Appendix 8 as described above.

4.7 Summary

In summary, I would say that I am committed to the idea of carrying out good, useful qualitative research and I have spent time selecting appropriate tools for both data collection and analysis. Bearing this in mind I intend to adhere to Yardley's characteristics of good qualitative research as demonstrated in Figure 4.3:

Figure 4.3 Characteristics of good (qualitative) research

Table 1 Characteristics of good (qualitative) research. Essential qualities are shown in bold, with examples of the form each can take shown in italics.
219
Sensitivity to context
Theoretical; relevant literature; empirical data; sociocultural setting; participants' perspectives; ethical issues.
Commitment and rigour
In-depth engagement with topic; methodological competence; skill; thorough data collection; depth/breadth of ***analysis.***
Transparency and coherence
Clarity and power of ***description/argument; transparent methods and data presentation; fit between theory and method: reflexivity.***
Impact and importance
Theoretical (enriching understanding); socio-cultural; practical (for community, policy makers, health workers).

(Yardley, 2000 p5)

All of these characteristics inform the ways in which I intend to carry out my data collection and analysis. In particular, with reference to the previous discussion around the development of themes, I am extremely sensitive to context. I take into account my own position within the research as well as the participants' perspectives

and the sociocultural setting, following appropriate ethical guidelines. The research is underpinned by relevant literature. This sensitivity to context serves to ensure that I am attentive to the other three characteristics, producing a piece of valuable qualitative research which can inform useful contributions to both knowledge and professional practice.

Chapter 5 – Analysis and Findings

5.1 Introduction

Following on from my previous chapter, in which I outlined the context for this piece of qualitative research, in this chapter I will use the approach described to analyse the data I have collected from my semi-structured interviews. This will enable me to arrive at some conclusions which will serve to inform my contribution to practice.

5.1.1. Themes

As stated and justified in the previous Chapter, I decided to use Template Analysis to analyse my interview data, and in doing so I planned to use a set of loose a priori themes which I was prepared to modify in line with recommendations made by King, regarding the use of priori themes with Template Analysis (King, 2019).

As previously outlined, these themes were identified early on in the research process and arose initially from my extensive experience in the field of data literacy. They were then refined and strengthened through my Literature Review and formed the basis of my initial interview questions. These five initial themes, defined in my Research Roadmap earlier in this chapter can be found in Table 4.6:

Table 4.6 Recap of initial themes

Theme	Description
1	The idea of employability as a graduate attribute
2	The growth of data literacy in the workplace
3	Employer perceptions of graduate skills (including data literacy)
4	Student perceptions of their own data literacy skills
5	Data literacy in the undergraduate Business and Management curriculum

Reading through a sample of 11 interviews (4 employers 3 Level 6 students, 2 Level 4 students and 2 staff) I realised that conversations had taken a slightly different turn regarding Themes 1 and 2 and I therefore decided to amend these themes slightly, see Table 4.7.

Table 4.7 Amended themes

Amended Themes	Description
1	What are the graduate skills which contribute to employability?
2	The importance of data literacy in the workplace.

5.1.2 Data analysis method

When selecting a method of analysis for my interview data, I was aware that it would be necessary to make a choice between hand-coding and using a software package such as Nvivo or Caqdas to automate the process. After some careful consideration I began to think that I would be able to interpret my data more fully if I were to take complete control and hand-code and analyse the interviews. In doing so I would hope to gain a deeper understanding of my study and be able to continually refine my interpretations (Basit, 2010). I decided that the best way for me to gain this deeper understanding of the subject of my research would be by taking time to read all my interviews, observing, refining and interpreting as I did so. I also felt that this approach would fit with my chosen method of Template Analysis in that it would allow me to identify and develop sub-themes as I read through my interviews

From a practical perspective, I also began to consider the time I had available and was of the opinion that the time taken to learn a software package would likely be considerable. This would need to be compared to the amount of time it would take to thoroughly read all the transcripts and engage with them in an appropriate level of depth. I In line with observations made by Belotto, I decided that I would prefer to hand-code my interview transcripts and take the time to engage fully with their content, rather than using an automated process (Belotto, 2018).

Having decided to take this approach, as stated previously I started off by reading 10 interviews and doing some preliminary coding on this subset of data, as recommended by (King & Brookes, 2017) starting with my broad a priori themes.

I used the highlight facility within Microsoft Word to colour-code and identify the themes described above in each of my sample of interview transcripts. Although I had loosely based my interviews on these themes, the semi-structured nature of the

interviews meant that reference to themes occurred at different points in the interviews, due to the natural and conversational way in which the interviews took place. Although I had some initial questions prepared to give structure to the interviews, I was very keen to use an informal conversational style as described by Swain and Spire in order to add context and authenticity to my data, allowing me to take full advantage of opportunities to expand and enrich it (Swain & Spire, 2020, p1).

Once I had coded my sample of interview transcripts, I was able to make the adjustments to Themes 1 and 2, as previously described. I then read back through the sample and attempted to identify sub-themes for each identified theme. At this point I decided that it might be better to code each group of transcripts separately by Stakeholder group. The sub-themes which emerged from each of the groups were similar, but not identical and I decided that it would be beneficial to code them separately. Having done this, my ultimate aim was to create a master template which would include the main elements of all the themes and sub-themes in an attempt at data source (Carter et al, 2014 p1)

I decided to deal with the four templates in the following way in this chapter:

1. Lay out each of the templates as a table, identifying themes and sub-themes
2. Discuss each sub-theme, including verbatim comments from interviewees These comments will be coded and attributed to individual interviewees as E1, L6S1, L4S1, A1 etc. to denote Employers, Level 6 students, Level 4 students and Academics respectively. The purpose of this activity was to present each of the themes and then use interviewee comments to develop a thematic narrative. Having coded my templates I did not want to then use my thematic analysis in the manner criticised by Hammer and Berland as "*only very brief excerpts of the qualitative data themselves to illustrate the coding scheme, tacitly or explicitly treating the coding results as data*" (Hammer & Berland, 2014, p38). Instead, I wanted very much to preserve the richness of the data I had collected using methods described by Holliday, organising my raw data into themes and then using data extracts to aid in the explanation of the themes, (Holliday, 2016). I purposely wanted to let the data extracts allow the narrative

to flow, with only brief descriptions to steer this flow in a logical direction, guided by the template coding.

3. Having completed this exercise, my intention was to create a Master template, in an attempt to distil the key themes common across all stakeholder groups. All themes outlined in this Master template would then be synthesised with both my Literature Review and Sectoral Analysis with a view to formulating the basis for a clear set of recommendations.

5.2 Templates

5.2.1 Employer Template

Table 5.1 Employer template

Theme	**Sub theme**
1. What are the graduate skills which contribute to employability?	1.1 Employers think that graduates need a good set of “soft” skills in order to succeed at work, including communication, organisation and problem-solving.
	1.2 Several employers highlighted communication skills as being lacking, evidencing this with comments about the use of “text-speak” in written communications and a reluctance to use the telephone.
	1.3 Several employers commented on the importance of placements, mentioning how undertaking a placement made graduates much more work-ready.
2. Data Literacy in the workplace	2.1 Everyone needs to be able to use Excel
	2.2 Modern business is driven by data
	2.3 Older people have better data literacy skills than younger people

3. Employer perceptions of the data literacy skills of graduates	3.1 Graduates are expected to be able to use spreadsheets to a reasonable level.
	3.2 Graduates generally do not have high levels of data literacy skill when they join the organisation
	3.3 Three interviewees commented that Economics and/or Accountancy graduates had better skills when starting work than general Business and Management graduates.
4. Student perceptions of their own data literacy	The intention is to explore this during interviews with the students themselves, so questions relating to this theme were not asked of Employers.
5. Data Literacy Curriculum content and delivery	5.1 Data literacy skills should be taught as a compulsory part of Business and Management Programmes
	5.2 Data Literacy tools (generally defined as Excel by the interviewees) are not taught in a way that is helpful to graduates when they join the workforce.
	5.3 Problem-solving was also seen as an important graduate attribute.

5.2.2. Employer Template discussion

Employer Theme 1 - What are the graduate skills which contribute to employability?

Sub theme 1.1	Employers think that graduates need a good set of "soft" skills in order to succeed at work, including communication, organisation and problem-solving.

This issue was highlighted by a significant number of employers. For example:

"Communication skills, professional skills. A lot of the roles we have are customer-facing, so we are looking for people who have this experience" (E8)

"Yes, they've got to have a range of skills, but I think it's their interpersonal skills and their communication skills because you could argue that IT skills can be taught but it is their behaviour that is probably the most important, the soft skills" (E7)

"Yes, definitely communication skills. Everyone talks about them, but they are hugely important. If you're going to work in a small team and don't have any contact with customers, your ability to undertake the research, and in absence make decisions and the ability to communicate that. Communication and influencing skills I would have thought. Not all graduates have those skills" (E1)

This last point leads onto theme 1.2. Employers were also keen to comment on their disappointment with a perceived lack of skills that graduates have in this area. Several commented on the fact that mobile messaging is the preferred communication method for graduates and young people:

Sub theme 1.2	Several employers highlighted communication skills as being lacking, evidencing this with comments about the use of "text-speak" in written communications and a reluctance to use the telephone.

"I know that not everyone is the most confident person in the world but generally how to speak to people, how to answer phone calls and emails because you think that it would be common sense or just be a natural thing but it definitely isn't and I've had

to pull people up about how they answer emails or speak to people on the phone but that to me is normal because I've been doing it for so long" (E5)

"I think they are very capable when it has anything to do with a mobile phone or social media" (E13)

"*I think it's second nature to them: texting. It isn't to me"* (E4)

"We get CVs with "text-speak" in them, because that's how they communicate now, more than face-to-face communication. Our current HR student is doing really well but he struggles to pick up the phone and speak to people. That conversational sid of things, talking to people and asking questions – they don't have that" (E8)

"It's kind of disturbing that people come in with First Class Honours degrees and I'm surprised some of their basic spelling is incorrect. The way people communicate these days through text is quite informal, like abbreviations of the English language" (E2)

Exploration of employer responses within these two themes can be considered in conjunction with work already carried out within Chapter 2, particularly with reference to the various employability frameworks discussed there. For example, according to the CBI/NUS report "Working towards your future: Making the most of your time in higher education", communication skills are one of the seven critical skills associated with employability (CBI/NUS, 2011).

It is therefore interesting that a number of my interviewees were of the opinion that graduates do not necessarily have good communication skills. It is also interesting to note that only one interviewee commented that they would expect these to be skills that graduates should have learned at University.

"It's probably communication skills, team working and soft skills you tend to get from going to University" (E7)

Sub theme 1.3	Several employers commented on the importance of placements, mentioning how undertaking a placement made graduates much more work ready

Placements appeared to be very important to interviewees who had actually been out on placement themselves when they were at University. placements were mentioned in the context of general business experience and also in the data literacy context and comments were also made to this effect by several Level 6 students.

It is interesting that interviewees were so motivated to mention placements, particularly as they were not asked a specific question on the subject. It appears that it was the experience of undertaking a placement rather than any experience of employing placement students was the motivating factor in the mentioning of placements by interviewees:

"*When I was at University I did a placement year and when I came here, I looked to introduce that in to this business as I found it really helpful and obviously I know that when you're at university it's really good to get practical experience. There are a lot of people who've been to university, but they haven't got the real working environment experience and that's sometimes even more important"* **(E5).**

"*I did a year's work placement experience at Hewlett Packard. I then finished my degree and got on to a graduate scheme at Jaguar Land Rover, so I very much went down the employer, getting trained role."* (E10).

The following interviewee did not mention her placement in detail but confirmed that she had done a placement in her current place of work, prior to gaining employment with the company, in common with other people currently employed there:

"*A couple of the girls we've got started on placements and just grew. Our Product and Office Manager was another placement student ten years ago"*

"the people who have had the biggest leap in the business have certainly had that year in industry" (E4)

The literature certainly confirms that work placements and "real-world experiences". In line with the various employability models discussed in the Literature Review for this thesis, Wilton identifies two main positive features of a work placement in the context of employability, these being the development of students' generic skills and personal attributes and the provision of opportunities for employment and

career development, specifically in the context of Business and Management graduates. (Wilton, 2012).

In addition to these observations from employers, all the Level 6 students who were interviewed were also of the opinion that work placements added to their employability skills and career prospects in the ways outlined above. Further discussion of this will be undertaken in 5.2.3 of this chapter.

Employer Theme 2 – Data Literacy in the workplace

Sub theme 2.1	Everyone needs to be able to use Excel

This comment (or something like it) was made by every interviewee in the Employer category. Excel was purposely not mentioned in the actual questions, and it is very interesting that all interviewees interpreted questions about data literacy and data management as being about use of Excel, or certainly spreadsheets. See below:

"Fortunately or unfortunately, decisions are made from spreadsheets. Every report that we do as a corporation is data-heavy: just tables and spreadsheets" (E2)

"90% of the work that we do to get all of the data on the website is Excel and CSVs. It's essential" (E5).

"We ask people to manipulate and work around data analysis; we ask people to do a lot of data manipulation in Excel" (E12).

"Spreadsheets are critical" (E8).

"Planning department; spreadsheets feature heavily because we use a lot of spreadsheets and look at a lot of data. In Planning, even in the lab they are using data and spreadsheets" (E8).

"If I ever want to analyse any data properly, I download a spreadsheet and look at it like that. It's so much better being able to work with spreadsheets and manipulate spreadsheets." (E10)

"We are a very spreadsheet business and even in HR myself – and HR being very people focused – there's a lot of data" (E3).

To a large extent this theme is linked to theme 2.2, as all employee interviewees were of the opinion that the manipulation and interpretation of data is vital to their business success. They are all also of the opinion that Excel is the tool to use to carry out these data tasks. Several interviewees had experience of larger systems,

but there was much concentration on downloading data from these systems into Excel.

(see comment above from E10, who was describing her use of Excel in the context of downloading data from a large accountancy system). Also:

"A lot of companies have systems such as SAP. It's not so easy to get information of systems like this so a lot of companies do set up databases and spreadsheets – it's hard to analyse data with SAP" (E8).

"We do a lot of exporting into SAP, but we are in a state of transition. Our new tool can pull data from SAP directly into Excel in real-time" (E10).

This theme really does demonstrate how important the use of spreadsheets is to business users. Even when companies have access to larger systems, many people still seem to use Excel as their main data analysis tool. This was a surprising outcome of the employer interviews and is possibly an area of consideration for further study.

Sub theme 2.2	Modern business is driven by data

To a large extent this theme is linked to the previous one. Everyone interviewed from the Employer stakeholder group commented on the importance of data management to their business. These comments were mostly accompanied by discussion about the use of Excel. Interviewees commented not only on the importance of data, but also the importance of employing people with good data skills:

"It's kind of given, it's fundamental to everything that we do and fairly complex storage, analysis questioning of fairly complex data is everything that I then present to a client." (E13).

"We can't make any decision without it being backed up with data" (E2)

"What we really need is people who've had experience in taking data and making sense of it. (E5)

“because our business is so data-driven one of our criteria when hiring people is that people are competent in data management” (E6).

This emphasis on staff with good data skills leads onto the next sub-theme in this section. There was an opinion put forward by some of the employer interviewees that older people in the workplace have better data skills than younger people. There were several reasons put forward for this, the first one being that they were better trained in preceding years, when “IT Training” was more prevalent in organisations when PCs and associated software were new.

“Many years ago, when was training, people had a very structured way of learning IT, so they did CLAITS and the ECDL and they worked through, methodically, the whole remit of the package of IT or the ICT suites” (E1)

There is also the idea that experience brings knowledge in the world of data management:

“You might have a 50-year-old person who has been with you for 20 years and they know everything about the various systems in the company. Often you can be surprised when they turn around and say don’t do that or that, that and that will occur” (E14).

This sub-theme is more valuable when set against the next theme (Theme 3) which is concerned with employer’s perceptions of the data literacy skills of graduates. Implicit in some of the analysis around this theme is a sense of disappointment in the lack of these skills being demonstrated by younger people.

It is also worth mentioning in the context of the Level 3 undergraduate template. Several interviewees in this group were of the opinion that it is the younger people who have the better data skills, so this is something to explore and discuss later on in this thesis.

Employer Theme 3 - Employer perceptions of the data literacy skills of graduates

Sub theme 3.1	Graduates are expected to be able to use spreadsheets to a reasonable level

Employers expect graduates to have a certain level of spreadsheet skill, in common with other members of the workforce:

"For our sort of roles, we would expect Advanced Excel skills, we would expect them to know roughly what a Pivot Table is, and we would expect them to at least know how to do an average and how to do a sum, just basic formulas." (E11)

Sub theme 3.2	Graduates generally do not have high levels of data literacy skill when they join the organisation

There is a perception amongst employers that graduates struggle with spreadsheets more than might be expected. There is an overall impression that skill levels are too low. Graduates coming into the business might have some basic spreadsheet skills, but they do not have knowledge of things such as Pivot Tables and linking spreadsheets together:

"It did surprise me that they could go through a university education process and not come out with the skills of Excel" (E2)

"I can compare them with other members of staff who are in their forties and fifties and have had more systematic training in IT and their capabilities are much greater, strangely in useful things like Excel" (E1)

"*In the general sense, when young people come in, I ask, "what's your knowledge of Excel like?" and in the interview they'll say it's fine but then when come in it's really, really basic"* (E5).

"I would say that I've seen varying level of proficiency, even when it comes to something like Excel. Just some of the basics are fine, when it comes to things like Pivot Tables and beyond, it catches them out" (E13)

In some cases, employers felt the need to send graduates on Excel training courses in order to improve their skills:

"we brought in somebody to train them, and they did a sort of master-class in Excel and brought in a third-party provider" (E2)

"We put them on Excel courses. The student we took on in R and D at the start of the year struggled with Excel because there was so much of it in his role, analysis and data gathering. We put him on a course – we do support them if they don't have the skills" (E8).

To a large extent the perception that employers have of the level of skill that graduates have with Excel is linked closely to their opinion of graduate data literacy skills, which most of them also believe to be low. There is a general feeling that graduates lack the ability to interpret data and do not really understand what data interpretation is all about:

"It's partly to do with their use and understanding of Excel, partly it's attention to detail when you enter the world of work. That's an area that could be improved. It's not about data analysis it's more about the interpretation of stuff in Excel" (E12).

One interviewee also made the observation that graduates have difficulties with estimating, which he identified as a very important skill in terms of understanding and interpreting data:

"They don't understand when you estimate you can round up or round down and by rounding one thing up and the other down, you're balancing them out… they're bright young people that apply, but they can still make mistakes and not know they've made them due to lack of estimating skills" (E6)

Sub theme 3.3	Three interviewees commented that Economics and/or Accountancy graduates had better skills when starting work than general Business and Management graduates.

This is worth mentioning here as there are comparisons to be made with some of the Level 6 student comments later on about the difference between subject-specific and more generic Business and Management degrees.

Interviewees who mentioned this subject stated the following:

"We did recruit a guy from Northumbria University who did a degree in Accountancy, and he was obviously at the other end of the spectrum and he was very good" **(E2).**

"*If it's a pure Business student versus and Accountancy and Finance student, there is probably a little bit of difference between these. I think there is probably commonality in terms of their courses, but the pure Accountancy and Finance are a little bit more practiced at that kind of stuff.* **(E3)**

"*I think we might have started with Business Studies people but we've moved over to ask specifically for people who have studied Economics because they've had spreadsheets in their studies and so they've got a good, basic understanding of Excel"* **(E6).**

Employer Theme 5 – Data literacy Curriculum Content and Delivery

Sub theme 5.1	Data Literacy skills should be taught as a compulsory part of Business and Management Programmes

This sub-theme arose from a direct Interview question. Not surprisingly, all interviewees were in agreement that data literacy skills should be a compulsory part of Business and Management Programmes. For this reason, no further discussion will be undertaken on this theme in this section.

Sub theme 5.2	Data Literacy tools (generally defined as Excel by the interviewees) are not taught in a way that is helpful to graduates when they join the workforce.

There was a general perception amongst the employer interviewees that data literacy teaching at University probably does not have a real-world focus and is taught in a 'dry' manner which does not inspire students, possibly leading to a low level of skill when these students graduate and start work.

"Learning Excel in the classroom would be really quite difficult without really good examples around you. When you're in work on a job and there's actual data that means something to you and means something to the role you're trying to accomplish…" (E10).

"I think these things would catch me out too if I didn't use them regularly. If people are anything like me if I am taught something in a 'dry' sense and then don't apply it for a period of time I lose it, I don't recall it" (E13).

"in terms of spreadsheets, even if they learn them, I'm wondering if the skills don't 'stick' because they learn them out of context" (E11).

Sub theme 5.3	Problem-solving was also seen as an important graduate attribute.

Several interviewees also mentioned that problem-solving is a key graduate attribute. This is a good example of the kind of comment they made:

"Graduates - Business and Management students – need to be taught how to solve problems. If they can do that, they can do everything in our current economy".

As can be seen in 5.2.3, Level 6 students had similar comments to make about their own level of data literacy (specifically Excel) skill and also the content and delivery of the data literacy teaching they had experienced at University.

5.2.3 Level 6 Student Template

Table 5.2 Level 6 Student template

Theme	**Sub theme**
1. What are the graduate skills that contribute to employability?	1.1 Students feel that a General Business degree is likely to make them more employable and also allows them to keep their options open.
	1.2 Placements are really useful, giving students time and space in which they can learn business skills.
2. The importance of data literacy skills in the workplace	2.1 Most students had used Excel or other data management tools in part-time jobs or on placement. They felt that their skills had improved dramatically in the work situation.
	2.2 Students who had been on placement had sometimes been exposed to other data management tools – particularly SAP and other Financial software tools. The two students who had used SAP commented that they felt those tools are much more powerful than Excel – they would like to have been exposed to them on their degree programmes.
	2.3 Several students commented on expectations that older co-workers have of younger people on their teams, in the area of facility with computers and IT.
3. Employer perceptions of student data literacy	The intention is to explore this during interviews with Employers so questions relating to this theme were not asked of Students.
4. Students' perception of their own data literacy skills	4.1 Students feel that they pick things up quickly in terms of mobile phones and social media and things which make their lives easier.
	4.2 Observations made regarding the use of business software, particularly Excel are very different.
5. Student perception of curriculum content and delivery	5.1 Content of modules is too hard. Students remembered studying BM9400 in First Year and struggling with the content.

	5.2 Content is not business-relevant enough and does not match what students have been required to do in the workplace.
	5.3 First year is not the best time to study a module like BM9400.

5.2.3 Level 6 Student Template discussion

Level 6 Student Theme 1 - What are the graduate skills which contribute to employability?

Sub theme 1.1	Level 6 Students feel that a General Business degree is likely to make them more employable and also allows them to keep their options open.

Several of the Level 6 students interviewed stated that their choice of a Business degree was in informed one, based on positive experiences at school. Only one of the students interviewed had not studied Business at school:

"I've always had a keen interest in Business. At school it came to me quite naturally compared to other subjects and it was the way people pushed me to go" (L6S3)

"*I've always had an interest in Business – it kind of sparked off from GCSE level so I studied business and business studies at GCSE and A 'Level so I always knew that was the path I wanted to take"* (L6S6)

"*Going back to my A' Levels, I always had a pretty strong interest in Business, and it was a subject I knew I wanted to take and I enjoyed it and I was pretty good at it and I didn't do too badly at it"* (L6S9)

The breadth of opportunity available on a general Business degree was also a reason given for the choice by most of the student interviewees, particularly with regard to employability and the range of careers they felt they would be able to pursue on graduation:

"You realise there are so many opportunities if you do business management, and a business course opens the door to so many different sectors" (L6S3)

"*It's also a good degree just to have because you're not tied down to anything in particular, you can go any way that you want in your career"* (L6S7)

"*I liked the fact that you could choose different subjects if you wanted to, whereas I didn't want to be restricted to one category: marketing, HR and so on."* (L6S9)

"*I mean you want to come out of University in a better position to get a job than when you joined so I assessed these options and thought, yes, Business Studies would put me in a better position"* (L6S11)

"When you apply for jobs if you've got a general business degree you can apply for more" (L6S1)

These comments are extremely interesting when set against comments from some of the Employers who were of the opinion that a general Business degree is not as useful in the workplace as an Accountancy or Economics degree.

Sub theme 1.2	Placements are really useful, giving students time and space to learn business skills.

In common with Employers, Level 6 students who had been on placement recognised the importance of the placement experience in equipping graduates for later employment. One student commented that they did not appreciate the importance of this placement experience until they had actually taken part:

"*Yes, I know a lot of people say it's important to do a placement and that it helps you, and it goes over your head but when you come off the placement you realise how much it means"* (L6S3)

Other students were much more positive about their desire to undertake a placement from the outset:

"*I really wanted some real work experience – how employers can take you on for a year in industry"* (L6S10)

"*"When I joined it was optional to do a placement. However, from the beginning I knew I would aim to do a placement just generally because it's getting more and more competitive and I knew that if I had a year working in industry it would be a lot more advantageous"* (L6S7)

Of the 13 Level 6 students interviewed, 10 had been out on placement and they all appear to have had a positive experience with a variety of employers. From the perspective of this research, it is interesting that the majority of students who

volunteered to be interviewed had been out on placement and had enjoyed and benefitted from it. The possibility cannot be discounted that those students who were keen and willling to undertake a placement are demonstrating the same approach to being interviewed and to share their experiences.

Level 6 Student Theme 2 - The importance of data literacy skills in the workplace

Sub theme 2.1	Most students had used Excel or other data management tools in part-time jobs or on placement. They felt that their skills had improved dramatically in the work situation

This is a strong theme emerging from the Level 6 student interviews. It is not an exaggeration to say that all students who were required to use Excel on their placement started off feeling at a disadvantage:

"There are so many things that I didn't know that I thought I did know, Excel being one of the main things – you think you know what Excel can do but there are so many things that companies use" (L6S12)

"*In terms of actual computer skills that we use in the business world, it's quite hard. I wouldn't say you're learning until you're doing it. The majority of my learning of Excel and knowing the little tricks here and there came from my placement more so than from education"* (L6S7)

"*I feel that when I started at xxxxx (placement company), they required a lot of Excel skills for my position, and I was comfortable using Excel but not to the extent that they needed me to"* (L6S6)

"*I didn't really appreciate the power of Excel until I was using it, but I was embarrassed not to know how to use it, even in terms of simple things like updating tables"* (L6S13)

In line with Theme 2.1 described above, this feeling of lacking an appropriate level of Excel skill at the beginning was generally replaced by a growing confidence and improvement in skills as students used the software in their day-to-day work situation:

"*It was all computer skills so after that I would say I was a lot more confident in terms of being able to work on a computer with Excel"* (L6S7)

"*My job was very much IT involved, and I used a lot of Excel, Word occasionally and PowerPoint but Excel was on a daily basis so I do think I have learnt a lot through my placement*" (L6S5)

"In terms of Excel I feel after last year it sky-rocketed my ability. I'm much more able to do data analysis and interpret data in a much more efficient and effective way" (L6S6)

These comments from Level 6 students who had undertaken a placement, serve to reinforce observations made in respect of the previous sub theme (1.2) and also comments made by employers (sub theme 1.3), specifically that placements are important and useful as part of the graduate learning experience. This theme also links with sub themes 3.1 and 3.2 concerning observations made by employers about the need for graduates to be able to use Excel at a high level and the lack of this high-level skill when graduates and/or placement students begin work.

Sub theme 2.2	Students who had been on placement had sometimes been exposed to other data management tools – particularly SAP and other Financial software tools

This is a minor sub theme, as not all students had been exposed to other software, but it is worth mentioning in the discussion of data literacy as a whole. As previously discussed, employers and Level 6 student interviewees generally made the assumption that data literacy actually means the use of Excel, but this is their own interpretation rather than a response to specific questions about Excel.

Two students had been exposed to SAP on their placement. Both students who used SAP appreciated the power and extent of a large corporate system and how knowledge of such systems might be useful in future business careers:

"I think after the twelve-month placement I learnt a lot of things. I learnt Excel but I learnt other things such as SAP, data warehouse, business objects. Looking back, I think there's so much I don't know. I feel that I've learnt enough to know there's a full career when I leave, and it will go on. Data never stops really, does it?" (L6S10)

"If you can say you use SAP it might help you to get a job in the future. That's where I feel that applications at University would really help – even basic knowledge of SAP and knowing what it is" (L6S12)

Sub theme 2.2	Several students commented on expectations that older co-workers have of younger people on their teams, in the area of facility with computers and IT.

This is related to sub theme 3.1 explored below, regarding students' perceptions of their own data literacy skills. With regard to the importance of data literacy in the workplace, several students mentioned the difference in age between themselves and their co-workers, unprompted. It is therefore something that they consider to be of note in that they perceive differences between the generations.

Amongst the students who mentioned the age of co-workers there was a consensus that older people have to learn data literacy and general IT skills, whereas young people are able to pick them up. Given this, the students were prepared to concede that older people are often better at using Excel, using examples of mobile phones and smart TVs to explain why young people are often better with "technology" than older people, including their parents.

"It seems like a lot of the business environments I've worked in, it's more middle-aged to older people who are struggling to adapt to the new systems and everything like that" (L6S2)

"I think in general, out of any other generation, we are probably the best in terms of technology, only because we were raised with it and that's something we've always had" (L6S9)

"I think in my department I was more computer-savvy than most people in that department. I don't know if that was more an age thing because most people were between forty and sixty and they expected me to be computer-savvy as well" (L6S12)

These views are interesting, in that they are almost the opposite of the views held by employers, who also commented on differences between the generations, generally being of the opinion that younger people have worse general IT and data literacy

skills than their older colleagues. This is possibly related to the idea that older people have been trained in the software they use in contrast to younger people just "picking things up". The next theme can be seen as a continuation of this one, examining students' opinions on their overall data literacy skills in general rather than in comparison to the older generation.

Level 6 Student Theme 4 - Students' perception of their own data literacy skills

Sub theme 6.1	Students feel that they pick things up quickly in terms of mobile phones and social media, but they find it more difficult to use business software such as Excel.

This is another strong theme emerging from the interviews with Level 6 students. All students interviewed were confident with technology such as mobile phones and social media and most felt that this was because they had never known a world without them:

"I don't know what it is about our generation, but I feel that all of us learn quite fast and on our feet as well" (L6S2)

"I think in terms of a young person's confidence with computing and technology, most of it goes down the social media side of things. Everyone's very confident to use that and know how to use it because in some ways it's designed for us" (L6S13)

"I think we can pick things up quite quickly in regard to things like phones and computers" (L6S4)

"I think as a group we're quite good in that we're young and we're always wanting to use the best technology and we're very good with smartphones and laptops and things" (L6S11)

There was also a sense that students and young people see technology as something that exists in order to make their lives easier:

I'd say, firstly most young people find ways to use technology to make their lives much easier so in a sense every time they use a computer, they use it to either organise themselves or to find something out" (L6S4)

Sub theme 4.2	Observations made regarding the use of business software, particularly Excel are very different.

"I think in terms of using technology in the workplace we are at a bit of a disadvantage. I suddenly realised when I went into the workplace, I thought my IT skills were quite good and then when I went in I had a bit of a learning curve" (L6S11)

"I feel young people think they have more knowledge than they do which is what I found when I was on placement. There were so many things that I didn't know that I thought I did know, Excel being one of the main things" (L6S12)

We are good with technology in general because we've been surrounded by it from a young age, but then specific job roles might require specific software and that's very new to us" (L6S4)

"I think my generation do have a better idea of how the basics work. In terms of actual computer skills that we use in the business world, it's quite hard. I wouldn't say you're learning until you're doing it" (L6S7)

Observations made by Level 6 students with regard to the theme of their own data literacy continues to build on the picture of a lack of confidence and low level of skill with the use of Excel by students and new graduates. This mirrors the opinions of employers on the same subject.

Level 6 Student Theme 5 – Students' perception of curriculum content and delivery

It was revealed that Level 6 students had many comments to make in this area, corroborating comments made by Employers. Content of their modules is something that they all felt comfortable with discussing. They had all studied the same First Year Module (BM9400) and were keen to give their opinions of it. As stated previously, most of them had been out on Placement and had used Excel in the workplace and were happy to make comparisons between what they had been taught at University and what they had been required to do in the "real world". They offered these comparisons unprompted, rather than in response to specific questions asked of them. Their responses can be categorised using the following sub themes.

Sub theme 5.1	Content of modules is too hard. Students remembered studying BM9400 in First Year and struggling with the content.

This was a very common comment, made by a majority of students, regarding both the module and Excel in general:

"It was never my favourite module and I think that was because I never had a very good understanding" (L6S7)

"I think everyone has a perception when you start university you dread Excel" (L6S6)

"This was probably my least favourite subject. Yes, I found it difficult" (L6S1)

"I can remember a lot of it going over my head. I remember sitting in a lot of classes and thinking 'what is going on?'" (L6S9)

Sub theme 5.2	Content is not business-relevant enough and does not match what students have subsequently been required to do in the workplace.

Looking back from a position of experience in the workplace, some of the Level 6 students felt that this was probably one of the reasons they found the content hard, whilst others found the actual subjects taught did not match things that they were expected to do:

"In the First Year the main parts I remember really was learning Solver. I think that's quite – maybe advanced isn't the right word- but it's quite a niche part of Excel" (L6S13)

"I think the content was way too in-depth for how useful it was in the workplace. I think it maybe had some academic relevance but in terms of actual skills to take into a workplace, I don't think it had much use for me. (L6S11)

"I remember finding things difficult because we were given lots of information and it wasn't explained how it would be used in a real-life environment so that's why I didn't understand". L6S1)

"maybe there could have been more examples, saying 'OK, so when you do become an employee in a certain job, doing this will help you do this, or doing this will make everything easier" (L6S4)

Students did also comment that the timing of the module was not ideal in terms of understanding content and taking skills on into the workplace at a later date.

Sub theme 5.3	First year is not the best time to study a module like BM9400

One of the main reasons that students had this opinion was the fact that they forgot much of the content, after only studying it in First Year:

"Because I haven't used Excel in two years, if I went back to it, it would take me some time to get back into it" (L6S8)

It's probably all gone in and given me skills that I didn't recognise at the time, but I wouldn't say that I ever remembered anything that we did specifically" (L6S1)

"I think once the module is over, people just kind of forget about it and they don't brush up on their skills unless they need to, and you forget because you're just not doing them regularly enough". (L6S7).

This comment leads into one of the other reasons which students gave for studying this type of content only in First Year, this being the fact that they do not revisit the content and practice skills, ready to use them in the workplace, so they do not have familiarity with Excel:

"I think it should be built on further as the degree goes on, in Second Year and Third Year in particular" (L6S10)

"I think familiarity with Excel would have generally helped – just getting used to Excel – when I did my placement. It probably would be helpful, but I just genuinely can't remember what I did – it was three years ago" L6S7)

"For example, this year I've got no IT modules so I feel if I go for a graduate job next year, when I first sit down, I'll feel I can't remember much so it would be really good to be able to brush up on your skills" (L6S3)

The final set of observations made by some students regarding the Level 4 module was the fact that students are often not as committed in First Year and do not necessarily understand the implications of some of the things they are required to do, especially if they find them difficult:

"In the First Year there was an Excel module, but I didn't understand then about the benefits or understand that it was used every day by everyone in the real world". (L6S10)

"It was hard. You're not expecting that in First Year" (L6S4)

5.2.5 Level 4 Student Template

Table 5.3 Level 4 Student template

Theme	**Sub theme**
1. What are the graduate skills that contribute to employability?	1.1 Level 4 Students interviewed saw a general Business degree as a positive choice
	1.2 Level 4 students had no comments to make on the importance of Placements.
2. The importance of data literacy skills in the workplace	Students had no comments to make about this.
3. Employer perceptions of student data literacy	The intention is to explore this during interviews with Employers so questions relating to this theme were not asked of Students.
4. Students' perception of their own data literacy skills	4.1 Students feel that they pick things up quickly in terms of mobile phones and social media and things which make their lives easier.
	4.2 Observations made regarding the use of business software, particularly Excel are very different.
5. Student perception of curriculum content and delivery	5.1 Content of BM9400 is too complex and can be confusing.

5.2.6 Level 4 Student Template discussion

This lack of engagement from Level 4 students is a finding in itself and will be addressed as part of my master thematic analysis later on in this Chapter.

Not surprisingly, the Level 4 students did not have a great deal to offer in terms of opinions on data literacy in the workplace, with their focus being in the area of education, concentrating on their degree subject and modules taught. The sub themes arising from the Level 4 interviews were similar to those which arose from the Level 6 students, so I decided to use the same (slightly modified template) identifying areas of similarity and difference between the Level 6 and Level 4 students.

Level 4 Student Theme 1 - What are the graduate skills which contribute to employability?

Sub theme 1.1	Level 4 Students interviewed saw a general Business degree as a positive choice

"I always wanted to do a Business degree; I knew that from careers talks and right through high school" (L4S1)

"I've been doing Business since I was fourteen/fifteen. I've done Business when it has been available for me to do it. It's always interested me" (L4S9)

In common with observations made by Level 6 students, two students did comment that a broad Business degree might be more advantageous when seeking employment:

"I always wanted to do Accountancy but then I had a last-minute change of heart and thought that Business with Management is a bit more broad and could lead to more opportunities" (L4S5)

"I think I want to start my own business, but I thought if I did 'Business with' I'd get a general aspect of Business and then it would open doors into other jobs if I was to decide I wanted to do something else" (L4S2)

In general, the Level 4 students had no opinion on the employability value of their degrees and also had nothing to say about Placements. None of them had definite

plans to undertake a placement. None of them felt that they had worked in an environment in which they had used any data literacy skills. Even gentle prompting about the value of data in the retail and hospitality sectors provided no answers, so I decided not to pursue this theme with them and move onto Theme 4.

Level 4 Student Theme 4 - Students' perception of their own data literacy skills

Sub theme	
4.1	Students feel that they pick things up quickly in terms of mobile phones and social media, but they find it more difficult to use business software such as Excel.

Level 4 students were very much in agreement with Level 6 students with regard to their facility with mobile phones and social media. This group of students also commented on the use of these types of technology by young people in general:

"In terms of technology, I think everyone's quite up on how to use a phone and how to work their way around software" (L4S1)

"*It's part of modern-day and everything's changing. We're sort of born to it. I wouldn't say we learn it; it's just given to us"* (L4S9)

"The technology I use on a day-to-day basis I'm OK with: computers, phones, things like that. I can figure stuff out quite easily" (L4S2)

"I guess social media is such a big thing right now and technology contributes to probably what younger people do the majority of the day" (L4S10)

Again, in common with the Level 6 students, the Level4s had a different view of how they coped with Excel.

Sub theme 4.2	Observations made regarding the use of business software, particularly Excel are very different.

"Technology-wise everyone knows how to work modern technology that's around us – but spreadsheets and the business side of technology – I don't think people really know" (L4S2)

"*I'm not sure about the Excel side of things. It was very different to what people would normally be using. It's not very user-friendly, as such, I find"* (L4S5)

We use technology to resolve things but it's difficult for a lot of us to do these things in Excel. It's not the same as the things we do on the Internet" (L4S3)

This lack of confidence with Excel relates to the next theme (Theme 5), concerning the curriculum.

Level 4 Student Theme 5 – Students' perception of curriculum content and delivery

All students were interviewed after they had completed the BM9400 module, some before the exam and some afterwards. Most of the students were in agreement with the Level 6s that they found the content of BM9400 difficult and/or confusing:

Sub theme 5.1	Content of BM9400 module is too complex and can be confusing.

"All the stuff that you showed us - I didn't know it did any of that and I've been using Excel since 2015. All of Microsoft apps in general – they are a lot more complex and more detailed that people first think" (L4S9)

"Excel did appeal to my liking for figures but I just found it very confusing and maybe we could have been taught a little bit better" (L4S5)

"Cope using Excel? I struggled; that exam was a tough one" (L6S9)

"I thought I was OK but then I see some people and I realise I'm awful compared to some. I think Excel is the hardest" L4S6)

"I just feel there's a lot to learn in a short amount of time. If you miss one little thing, you're miles behind and it's difficult to catch up" (*L4S5)*

"I thought it was easy to learn in the class but it was putting what you'd learnt in class into your outside work. Sometimes I'd get a bit stuck, say if I saw a formula I wouldn't know how to recreate that when I was revising" (L4S10)

"I think the teaching was good but there could have been more set practice questions maybe. I think everyone gets the idea about what we're doing but not why we're doing it" (L4S2)

This comparison with others and evaluating themselves as part of their group was a feature of the Level 4 interviewees. Interestingly, several of them commented that they had found BM9400 to be not too difficult themselves, but that other members of their class had struggled:

"I feel I cope quite well because I had a good maths background anyway, but I do feel that some people cannot grasp something, and you have already grasped it and you're sitting there while they go over it again and again" (L4S7)

"There are a lot of people who don't know how to put a formula into Excel but personally I did. I did feel a lot of people didn't understand that and with doing the module, struggled getting started because it advanced quite quickly" (L4S1)

5.2.7 Academic Staff Template

Table 5.4 Academic staff template

Theme	**Sub theme**
4. Academics perception of student data literacy skills	4.1 Students feel that they pick things up quickly in terms of mobile phones and social media and things which make their lives easier.
	4.2 Observations made regarding the use of business software, particularly Excel are very different.
5. Academic perception of curriculum content and delivery	5.1 Content of BM9400 is too complex and can be confusing.

5.2.8 Academic Staff Template discussion

Interviews with academic colleagues were rather different to those carried out with other Stakeholder groups. There were several reasons for this, the first being the number of colleagues I was actually able to interview. There are seven members of staff in the teaching team (including myself). By the time I began to arrange interviews with staff (In March/April 2020), the pandemic had started, and the University had started to operate exclusively online. One member of staff was on extended sick leave, and another left the University in March. Interviews had to be carried out online and various logistical problems meant that I was only able to interview three members of staff.

This was not a major problem. I had always intended to interview the staff at the end, after all the other stakeholder groups. I felt that their input was to add depth to the data I had collected from the employers and students. Once I had reached the end of interviews with employers and students, I felt that I was beginning reach data saturation and did, in fact question whether it was necessary to interview the academic staff. However, I also felt that their perspective is different to that of the other stakeholders and so decided it would be very useful to include them. Three interviews were enough to capture the academic perspective and they served the purpose of adding depth and reinforcing themes very well.

The other difference between the academic staff interviews and those with other stakeholders is the relationships that I have with these academic staff. I conducted this set of interviews with the understanding that experiences shared with my colleagues could extend the depth of the discussion (McEvoy, 2002) but I did not want to exploit this shared experience by steering the conversation in the direction of my own opinions. To this end I encouraged the interviewees to talk naturally, using my questions as gentle prompts.

This resulted in some very interesting discussion, which was generally focused around the two main themes of perceptions of student data literacy (Theme 4) and also the data literacy curriculum (Theme 5). Interviewees did engage in discussion around the earlier themes but given that I feel I achieved data saturation in these areas, I decided to concentrate on Themes 4 and 5 where the academics really did add depth to the discussion.

Academic staff Theme 4 - Academics perception of student data literacy skills

Sub theme 4.1	Academics agree that students are confident users of mobile phones and social media applications but less so on Business data applications, particularly Excel

All three interviews made comments in this area:

"If they need to look for something on Google or a search engine, they're OK with that. In terms of getting a data set and doing something with it, I'm not convinced now that they're any more capable than they were 25 years ago when I first joined the institution" (A1)

"*Give them a mobile phone, give them a Gameboy or an X-box or something like that and they can whizz on that but using some of the software, particularly in the Business School anyway, some of them come in and they don't really understand why they need to use it or what it's for"* (A2)

"I've read it recently in a piece of work and it's where millennials and others describe themselves as 'digital natives' and basically, they're saying, "IT's always been part of my life" which is true but by IT they mean, I can use social media and I can put a post on, etc. and I can be in touch with my friends" (A3)

This is very much in line with comments made by both employers and students, so does not really need any further discussion.

Sub theme 4.2	Observations made regarding the use of business software, particularly Excel are very different.

Comments in this area made by academic staff were around the area of student interest and engagement with the use of Excel. (All academics were speaking in the general context of the BM9400 module on which we all teach). All three interviewees were of the opinion that students have an actual antipathy for the subject. They find it too hard because they feel like they "can't do Maths", they do not see what it has to do with business, and they often disengage:

"There's that extra barrier of resistance: 'why do we have to know this?'; 'why are we doing this?' and on top of the technical requirements of it, that produces some of the barriers" (A1)

"Why do I need to learn anything about this? What numbers and spread sheets – why do I need to know anything about that for my job?" (A2)

"There's resistance over teaching them stats: "I can't do maths" and there's also a second resistance in terms of learning how to do something properly in a structured way. They see some raw data, get the calculator out, add these figures up. What we're saying is, no, let's use the power of the spreadsheet and let's talk about interpretation and they're getting bogged down in some of the basic maths" (A3)

Sub theme 5.1	Content of BM9400 is too complex and can be confusing.

As can be seen above, all three Academic staff observed resistance to learning Excel and reluctance to engage with mathematical and statistical content. Staff considered the possibility that this was associated with lack of context in the teaching content:

"there's very little discussion about contexualisation of examples of where things are used and when I use this or whatever, and whatever job this is what I did with it, this is what I found" (A1)

"I think it's understanding the application of it in business and the short cuts and the interpretation of it" (A2)

Discussions with Academic colleagues served to confirm many of the remarks made by students and employers regarding student engagement and understanding of the management and interpretation of data using Excel. The impression that students are daunted by anything to do with numbers and struggle to understand why they are being taught to use Excel was very prevalent during my conversations with colleagues. This adds depth to the comments made both by students themselves and also by employers who were generally surprised at the low level of Excel skills demonstrated by graduates and placement students. All of the rich data collected in these interviews and distilled into conclusions in the next chapter will serve as a very useful basis for recommendations to practise, also in the next chapter.

5.3 Knowledge Workers

As part of my semi-structured interviews, I asked employers and students if they had heard of the term "knowledge-worker". I did not ask academic staff this question as I thought it was more relevant in the context of employment rather than teaching. Based on engagement with literature in Chapter 2, I had already arrived at the conclusion that this was a term which is often used, but hard to define. I was also of the view that "knowledge workers" was a definition which could be applied to the type of employment taken up by Business and Management graduates. I had hoped that introducing the term might facilitate some discussion.

However, none of my interviewees from any of the stakeholder groups acknowledged familiarity with the term, even when asked what they thought it might mean. Some of the Employers were prepared to make a guess as to the meaning of the term. A selection of their brief comments can be found below:

"We talk about the knowledge economy, don't we? I'm familiar with that. I don't think it's a term that is bandied about"

"I wouldn't use the term "knowledge workers" – but we have a scenario where by virtue of working in this business and this organisation, you know a lot of stuff"

"I haven't heard of knowledge workers as such"

"I'd be the only one who could be described as a 'knowledge worker'. So the people downstairs are knowledgeable and in order to do their job they have to be very knowledgeable but they don't use those kind of titles"

"I prefer to call them analysts because I think that gets to grips with the fact that they're actually doing what it says on your definition – looking at data and understanding it and interpreting it in a way that knowledge work doesn't"

"I have never heard of the term "knowledge-worker". I would assume that it is someone with experience and knowledge in a certain area, but I haven't heard of the term"

"No. We refer to some people in the business as 'knowledgeable experts' within their fields, although it's not in their job title"

Other employers did not venture an opinion on this subject, in common with all of the students. This is a finding in itself as it reinforces the idea that the concept is not well-defined or understood.

5.4 Chapter Summary

Table 5.5 summarises the findings by stakeholder groups:

Table 5.5 Key findings by stakeholder group

Stakeholder Group	**Key Findings**
Employers	Employers are of the opinion that graduate employees are good with "technology", but this does not necessarily translate into being proficient with Excel, which is an important part of most jobs.
Level 6 Students	Level 6 students are also of the opinion that their Excel skills are not as good as their skills with other technology, and they feel disadvantaged by this in the workplace. They feel that work placements are very helpful. In terms of learning Excel at University they feel that they need more than one module at Level 4.
Level 4 Students	Level 4 students find Excel difficult to learn in the BM9400 module. They do not really understand why they need to do this module. Even though they are committed to their Business degrees they do not see how BM9400 relates to the Business world
Academic Staff	Academic staff are disappointed with students' attitudes towards the BM9400 module and learning Excel. They feel students are resistant to

	the module because they find it too difficult and do not understand its use. They also admit that it is hard to put the learning into a Business context whilst also trying to teach Excel skills to an appropriate level.

The key findings above, distilled from the stakeholder responses and subsequent thematic analysis will be used to inform a set of key themes set out in the next chapter. Conclusions arising from the sectoral and institutional examination of data literacy teaching will also be used to inform these themes

Chapter 6 – Discussion, Conclusions and Recommendations

6.1 Purpose of chapter

The purpose of this chapter is to identify and discuss the key themes emerging from the detailed analysis of qualitative data carried out in the previous chapter. As described previously, this analysis was laid out in such a way that themes emerging from interviews with all stakeholders were identified and explored, in order to capture the richness of the data collected.

In this chapter I will use the rich themes that emerged to identify a further set of key themes which will serve to inform my final recommendations. Discussion of these themes will be supported by synthesis with relevant literature and the sectoral and institutional analysis carried out in Chapter 3.

Key themes have been identified as such because they fit two broad criteria. The first of these is the presence of discussion in interviews with all stakeholder groups, and the second being my own interpretation of the themes as those which appear to lead to appropriate recommendations, based on literature, sectoral and institutional analysis. I am conscious that any kind of after-the fact narrative tends to make the research process look more linear and tidy than it actually is (King & Brookes, 2017) and I am not using this approach to "tidy" my data in any way. Rather, I plan to use my "double-insider position" with regard to my relationship to the areas of both my research and my interviewees (Adriansen & Madsen, 2009) to aid me in the development of relevant recommendations.

Following on from identification and discussion of themes, recommendations will be made based on these themes as described above. A case study will be presented, demonstrating the application of recommendations to a "live" Level 3 module with the title "Business Information Management".

This chapter, and the thesis will conclude with discussion of recommendations to knowledge, recommendations to practice, considerations for further research and a reflection on my development as a researcher.

6.2 Identification of key themes

Four key themes have been identified, as detailed in Table 6.1:

Table 6.1 Key themes

Key Theme	Description
1	Students and graduates are comfortable with using a wide range of "technology", but this does not translate into enhancement of data literacy skills.
2	All stakeholders consider that mastery of Excel is the most important skill with regard to data literacy, not appreciating that it is really only part of the data literacy picture.
3	All stakeholders are in agreement that "real-life" experience or cases are the best way to develop data literacy skills.
4	There is a consensus that data literacy skills need to be taught at all levels of the curriculum.

In the following sections, I will discuss each of these themes in some depth, considering the rationale for each, as it can be evidenced from literature, sectoral and institutional analysis. I will then consider gaps in literature and practice and areas where examination of the theme identified could improve practice.

6.2.1 Student and graduate data literacy skills

By virtue of their probable age, current undergraduates and recent graduates could be defined as *digital natives* and as such are likely to be very comfortable with digital technology. This was apparent from the interviews. However as previously described, it is the skills associated with data literacy (particularly Excel) that students find challenging to learn.

Johnson and Berenson identify the issue that I am dealing with in this section, recognising that the emphasis on analytics in the latest AACSB guidelines means that it is a subject which needs to be given serious consideration when designing undergraduate business curricula, given that the so-called Generation Z student audience is more technologically capable than their predecessors and often less

quantitively prepared and less interested in text book reading (Johnson & Berenson, 2019, 215).

This impression of a set of students expecting a dynamic, connected and instantaneous experience of learning does not match the experience that they encounter when entering a classroom to be taught to use Excel. If those students are also quantitatively inexperienced this is also likely to raise their anxiety and make them even less likely to engage with the experience.

Comments made by student interviewees imply that they generally find the Level 4 BM9400 module to be “too hard”. This is possibly linked to the comments made above about different styles of learning. However, it is also likely a specific function of a significant number of Business and Management students and their previous experience with quantitative subjects. As mentioned by the academic interviewees in my study, there is generally no pre-requisite for Business and Management students to have studied a quantitative subject after GCSE. For example, at Newcastle Business School there is no A’ Level subject requirement for First Year entry on the BA Business Management degree in September 2020 (Newcastle Business School, 2020). Evidence provided by the academic and student interviewees suggests a majority of entrants to First Year at Newcastle Business School have not studied any quantitative subjects beyond GCSE. This suggests lack of skill with this type of subject, linked to lack of motivation to select such subjects at A’ Level or equivalent.

The phenomenon of student resistance to quantitative subjects is beginning to be documented in literature. Laugerman and Saunders evidence this resistance with regard to business and management students in the context of statistics teaching, mentioning that discussing the barriers to successful learning experienced by many students due to anxiety, motivation or difficulty with quantitative understanding. (Laugerman & Saunders, 2019). Opstad reiterates that the statistical skills of many business students do not meet the expectations of their tutors in these fields, going on to confirm the importance of quantitative understanding in business and therefore the importance of attitudes towards statistics for undergraduates in business fields (Opstad, 2020). Howard and Warwick also highlight the prevalence of what they term as “mathematical anxiety” amongst undergraduate business students. In a study carried out at a UK Business School in 2016, of a sample of 330 new Business

School students more than half express some degree of this anxiety which the authors believe leads to avoidance and lack of engagement with the subject (Howard & Warwick, 2016). These students may well have avoided mathematics for several years, due to their anxiety, which is possibly one of the reasons that they chose not to take the subject any further after school.

The difficulties that students often encounter with quantitative understanding is made specific in some of the module descriptions provided by the Business Schools examined in my sectoral analysis. For example, from the University of Essex, "*IMPORTANT: Some students find the maths and statistics to be challenging. This is normal. If you find the lectures to be difficult and perhaps moving too quickly, be sure to make use of the additional support available*" (University of Essex, 2020).

If we accept this high proportion of Business and Management students who are resistant to quantitative subjects as fact, the reasons given above go some way to explaining this. However, there are some other important factors to recognise, if we want to try to reverse this resistance and increase engagement with the subject.

The first of these factors is the relationships between us, as the academics with our student population. Academic staff interviewed were of the opinion that student skills and interest in quantitative subjects were generally low. A significant number of employers also pointed to this lack of skills and interest with regard to placement students and graduates in the workplace. On the other side of this relationship, students who had been out on placement commented that they felt that they found it easy to "pick up" systems and technology in comparison with their older peers. They did also comment that this generally did not extend to the use of Excel. When considering this issue, I felt it would be worthwhile to go back to the digital natives discussion. Within this discussion, if our students are digital natives, we are largely Digital Immigrants, this being people who were not born into the digital world (Prensky, 2001). As Prensky wrote his influential paper twenty years ago, the terms Digital Native and Digital Immigrant have been disputed and refined over the years. For example, Wang et al argue that there are not two rigidly defined groups, rather there is a continuum which can be described as "digital fluency" (Wang et al., 2013). This is a very useful way of regarding the situation, and if we consider ourselves, the

academics teaching quantitative and digital subjects (specifically Excel) on this continuum we are probably towards the upper end with a high level of digital fluency.

Even so, current delivery appears to use traditional and established ways of approaching teaching and learning in this subject area. We have been used to teaching all subjects using the methods of lectures and seminars/workshops and we apply these methods to the teaching of quantitative subjects and Excel in the same way as other subjects. This appears to be the normal approach in most institutions as can be seen in my sectoral analysis, with most modules described as being taught with a combination of a one or two-hour lecture, plus a one or two-hour seminar.

The traditional methods of teaching preferred by academics also seem to be favoured by the older employer interviewees. Several of these commented on their own experiences of learning software in the early days of their careers. They had generally learned by attending training courses and were of the opinion that this was the best way to learn. In terms of improving the skills of placement students and graduates, the solution offered by these employers was to “send them on a course”. As someone who used to offer this kind of training on a regular basis, I feel qualified to offer an opinion on this and I would agree that it is a good way to improve skills in people who need to use the software on a regular basis. However, my experience also leads me to observe that much of the way that we teach Excel skills at University mirrors the old style “IT Training course” approach with a tutor guiding students through a set of pre-prepared examples to achieve an agreed solution. In the final chapter of this thesis, I will be considering other methods of teaching which might help to impart the necessary skills in a way which suits digital natives rather than Digital Immigrants.

My final observation in this section is concerned with the content of the subjects taught. It is evident from the interviews and from the discussion in this section, that Business and Management students are resistant to quantitative subjects as they are taught at University. It is also evident that most University Business Schools use Excel as the main vehicle for teaching these subjects. In this section, I have discussed the issue of quantitative subjects, but not mentioned data literacy, which is the subject of this research. This is deliberate. All my interviewees, from all

stakeholder groups talked almost exclusively about Excel when the topic of data literacy skill was mentioned. Looking at my sectoral analysis, the vast majority of University Business degrees contain one module which can be described as a data literacy module and this module is generally an Excel skills module. The next key theme that I will cover is this reliance on Excel, both in business and in teaching.

The QAA Benchmark statements for Business and Management refer to Information Systems and Business Intelligence, the ability to analyse and evaluate a range of business data and the use of quantitative skills to manipulate data, evaluate, estimate and model business problems, functions and phenomena (QAA, 2019). These skills resonate much closer to the skills that I am defining as data literacy, rather than just an ability to use Excel at a high level.

To summarise, the research identifies that there are various factors which could play a part in the resistance that students have to learning on the modules which can loosely be described as data literacy modules.

These are:

1. Learning styles – current students prefer a more active, immediate style of learning.
2. Prior experience – students find Excel hard to learn, having not been exposed to quantitative subjects for several years.
3. Teaching structure – academic staff prefer a traditional method of teaching with lectures and seminars (linked to point 1).
4. Excel itself – skill with the software is not the same as understanding the broader picture of the use of data within the business environment.

In 6.2.2 I will discuss the issues associated with the reliance on Excel as the main data “tool” in both business and undergraduate teaching.

6.2.2 Reliance on Excel as the principal data literacy tool in business and undergraduate teaching

When conducting my first set of interviews, with the employer group of stakeholders, I was surprised to learn that they all see Excel as the main tool that they use for all aspects of data management and analysis. As part of my interview structure, I showed them all the Universities UK definition of the term “data literacy”. See below:

“*Research design, data collection, data management, data analysis, modelling, interpretation and the presentation of research findings*” (Universities UK, 2015, p11)

Most of them felt that they did not carry out research design, this being seen as the preserve of academia, but they related all other aspects of the definition to the use of Excel by themselves or within their organisation.

This relating of the concept of data literacy to the use of Excel was repeated by all other stakeholder groups. Interestingly, students and academics mentioned research design and data collection as aspects of data literacy that students did not learn at any point. This was mentioned by all academics in the context of Level 6 Dissertations. It was felt that the lack of formal teaching of these areas prior to Level 6 was detrimental to students understanding of what it is possible to do with data. (see analysis of academic interviews in Chapter 4).

At this point, it is worth returning to the subject of this DBA thesis, which is an exploration of data literacy skills, not just skills with Excel. The way in which all stakeholders assumed that data literacy skills are inextricably linked to Excel is revealing and therefore worthy of examination as a key theme arising from the interviews and as something to be addressed in my final recommendations.

6.2.1 investigated some of the reasons for students’ reluctance to engage with the teaching of quantitative subjects (these being the closest subjects to data literacy in the current curriculum and Newcastle Business School and other Business schools examined). There is some evidence that Excel is a useful way to introduce quantitative and statistical skills to resistant students who perceive the subject to be difficult. Clayton and Sankar confirm this in the context of the decades-long challenge of teaching statistics to undergraduates (Clayton & Sankar, 2009). These authors cite the 2008 AACSB standards as evidence that statistical understanding is

vital to undergraduate business education "*statistical data analysis and management science as they support decision-making processes throughout an organization*" (AACSB, 2008) and conclude that Excel is a useful tool to use to help undergraduate business students achieve an understanding of quantitative and statistical tools. They recommend that it should be the tool of choice for statistics instructors as it helps to overcome the problem of student resistance to the topic.

However, it must be pointed out that this paper was written over ten years ago and the AACSB standards have been subject to two major updates since then, one in 2013 and one in 2020. Instead of discussing data analysis and management science the 2020 standards state, under the heading of "Technological Agility" that undergraduate business curricula should include teaching in "Evidence-based decision making that integrates current and emerging technologies, including the application of statistical tools and techniques, data management, data analytics and information technology throughout the curriculum as appropriate". (AACSB, 2020).

Based on the AACSB standards highlighted above, it can be seen

that it is this more broad-based technological agility with an emphasis on decision-making using a range of data skills which links more closely with a definition of data literacy than the older emphasis on statistics. It may have been the case in 2008 that Excel was the best tool to use to introduce reluctant undergraduates to statistical and quantitative subjects. However, from my own experience and the comments made by my interviewees it appears that Excel is now part of the problem, with students being as reluctant to use Excel as they were previously to engage with older methods of learning statistics.

Examining this issue, we can assume that if students are only exposed to a narrow focus on statistics and quantitative analysis, through the medium of Excel, their data literacy skills as defined by Universities UK and the AACSB standards, will not be sufficiently developed. Add to this a resistance to use Excel to these topics and a level of mathematical anxiety and the result is a significant number of graduates with low data literacy skills who do not meet the needs of employers.

It is recognised in literature that the place of data literacy in the curriculum is difficult to position and define. As previously discussed in this thesis, the concept is often not

defined at all. It is much easier to find definition and discussion of “information literacy” and “digital literacy”.

Macy and Coates explore this in their discussion of the idea of “data information literacy”. They express this as a skill which is necessary for graduates entering the business world, and their description of the dilemma in positioning the skill comes very close to my own efforts to define and position the skill I am calling data literacy. “*Some consider data information literacy as a facet of information literacy, while others see it as a separate set of skills. Yet another perspective places DIL under the broad umbrella of digital literacies sharing common elements with numeric and statistical literacy*” (Macy & Coates, 2016, p2)

This links with the Prado and Marzal’s competency framework, recognising that data literacy is embedded within Information Literacy, and these authors add to a recognition of the broad nature of the subject. Examination of the standards and frameworks associated with undergraduate business education further serves to demonstrate this and highlight the overlap between definition of skills. In the QAA Subject Benchmark statement for Business and Management, two of the relevant skills identified could be included in a definition of data literacy, these being:

“*Research: the ability to analyse and evaluate a range of business data, sources of information and appropriate methodologies, which includes the need for strong digital literacy, and to use that research for evidence-based decision-making*”

and

“*Numeracy: the use of quantitative skills to manipulate data, evaluate, estimate and model business problems, functions and phenomena*” (QAA, 2019)

Based on data collected during my interviews with all stakeholders and my own experience, I would say that we at Newcastle Business School concentrate much more on the skill of Numeracy rather than on Research, and we use Excel as our sole vehicle for addressing this skill. Examining the Business School modules identified in my sectoral analysis, it would appear that most other University Business Schools in the UK take the same approach. A combination of both the

Research and the Numeracy skills identified by QAA give us a much closer match to the skill of data literacy.

For the purpose of this section of the thesis, I do not intend to take this discussion any further. I would just like to demonstrate the point that a debate is taking place and it is beginning to be recognised that there is a skill which undergraduates need to acquire which transcends a knowledge of the use of spreadsheets to carry out quantitative tasks. I am calling this skill data literacy and I believe that it needs to match the AACSB definition of Technological Agility much more closely, taking into account the use of data management and data analytics as well as statistical tools and techniques. I also believe that students should learn to recognise and appreciate data in all aspects of their learning and really understand its importance in all aspects of business.

To put it another way, we should help them to become “data savvy”. This is a term which is increasingly in popular usage. Zorana for example believes that data literacy should begin in secondary schools and should be integrated across disciplines (Zorana, 2015) in the pursuit of creating data savvy learners. If this was to happen in secondary schools, it would make the teaching of data literacy in Higher Education a much easier task. In the Business School we could also work to incorporate data literacy throughout the curriculum. Recognising the debate and the importance of data literacy is a step in the right direction, away from offering quantitative and statistical (modules based on Excel which the students find difficult to engage with.

At this point it is worthwhile briefly examining the role of Excel in the business world. As I mentioned at the beginning of this section, my employer interviewees surprised me with their reliance on Excel as a data literacy tool. I am not intending to explore the reasons for this in this thesis. However, it is worth mentioning as a final note to this section. Several of my employer interviewees were business graduates themselves. It might be interesting to contemplate our current students and recent graduates within this context. If we teach them to become data savvy and technologically agile with a good appreciation of the importance of data to all aspects of business, we can hope will they take this skill forward as they become business managers and leaders and use their skills to benefit their organisations. This is worthy of consideration as we develop undergraduate data literacy teaching. If we

can instil an appreciation of data, it’s transformation into information and the associated development of useful organisational knowledge, we could equip future graduates with a curiosity and willingness to explore a wider range of available tools when they enter and progress through the workplace. This would be a true demonstration of technological agility and a lifelong learning mindset.

To recap, there are two main reasons why an over reliance on Excel is problematic with regard to the teaching of data literacy skills at undergraduate level. These are:

1. Using Excel as a vehicle to teach quantitative and statistical content to business students is a good idea in theory as it possibly helps to overcome fear of numbers in students by introducing concepts in a less threatening way. However, students have not often had much prior exposure to Excel and find the tool just as threatening as the content.
2. Data literacy is not just about Excel. This is generally poorly understood and a concentration on Excel in the curriculum means that there is a concentration on quantitative and numerical skills, with little attention paid to the more analytical and problem-solving aspects of data literacy.

One of the main areas in which the teaching of data literacy could be improved, would be to ensure that content is as closely linked to real-world situations as possible. Excel could still play an important role in this type of content and would continue to be a useful tool in improving data literacy skills and preparing students to use them in the business world.

The issue of real-world related content is the third key theme to emerge from my interviews and will be dealt with in 6.2.3.

6.2.3 The importance of a real-life experience

Interviewees in all my stakeholder groups (apart from the Level 4 students, who had no experience of placements) commented on the importance of work placements as being critical in the development of good data literacy skills. Students who had been on placement identified the experience as a really important part of their degree programme. There is a general consensus that work placements make graduates more employable by allowing them to develop themselves in an employment setting thus enhancing their pre-professional identity (Jackson, 2017). Work placements have also been shown to improve Final Year performance (Jones et al., 2017). Regarding the specific subject of data literacy, there is little in literature to confirm that improvements are a direct outcome of work placements. However, in terms of my interviewees, they expressed that they had made direct personal improvement with regard to their pre-professional identity in that they felt that having to work with data on placement improved their understanding of data in the business context. With regard to improvement in Final Year grades, Level 6 students and academic staff groups both commented that an enhanced understanding of the use and importance of data gained on placement helped with the data collection and analysis parts of their Dissertations, which is a critical part of their overall degree.

Having accepted that a work placement generally enhances student performance on degree programmes, take up of placements is actually quite low. HESA data shows that students enrolling on degree programmes containing an optional placement year had increased by 59% between 2009-10 and 2017-18 (HEPI.ac.uk, 2019). However, during that time, students actually completing a placement only rose from 8.2 to 8.6, which is a small proportion of students completing a degree. I am Programme Leader for Business with Management at Newcastle Business School, which is a Programme with an optional placement year. This year, out of a cohort of 116 eligible to progress at the end of Level 5, only 12 are out on placement.

There are a number of reasons for the low take-up of placements, including student reluctance when the placement year actually comes around as well as greater competition for available placements. However, the purpose of this thesis is not to discuss placements in detail. A placement is undoubtedly a valuable experience for students, enabling them to develop a range of professional skills, including enhanced

data literacy skills. However, the fact that a low percentage of students on Programmes with optional placement do not actually undertake a placement, means that they need to gain experience of real-world business issues as part of the curriculum. The importance of real-world business focus in business degrees is evident in both QAA and AACSB standards, with particular emphasis on rapidly changing business processes and technologies. This has already been discussed in Chapter 3. This real-world focus could be said to be even more important in the field of data literacy, where the tools and methods are changing particularly rapidly. However, the current methods of approaching data literacy teaching, using analytical tools tends to be approached in a very structured way. Green et all comment that this approach leans towards algorithmic “problems” with a single correct answer and students attempt to find this answer without any contextual understanding of the formula or its results. (Green et al., 2015).

Within my own institution, Northumbria University, real-world experience is one of the key learning experiences embedded in all degrees. From the University website: “Opportunities to apply your knowledge and build your skills are embedded throughout all of our courses. These real-world experiences will not only make you more employable but could fast track your career or help you start your own business” (Northumbria University, 2020)

Turning to my own research and the embedding of real-world content within data literacy related modules, the issue was mentioned by members of all stakeholder groups. Employers were of the opinion that placement students and graduates they employed did not understand the real-world relevance of Excel in business and felt that this might be due to students being taught skills in a “dry” manner, concentrating on the skills and the tools, rather than the business application. Students confirmed this, with several expressing a lack of understanding as to why they were learning the skills, and what application they have to business. Academic staff commented that students understood much more about the business relevance of Excel when they returned from placement, having experienced its use in a “real” environment.

Overall, then within both the context of UK business education and Northumbria University, real-world experience is seen as a key attribute of successful degree

programmes. The key question emerging for this thesis is, how to apply this real-world focus to data literacy modules, if this is not happening already?

In an attempt to answer this question, I do not intend to make specific recommendations here, but to formulate a general approach which can be used to inform my ultimate recommendations contributing to practice in the final chapter of this thesis. In doing this, I aim to address the issues already identified in this chapter, that current practice with regard to data literacy modules is focused very much of Excel-based statistical tools which are taught via the use of structured problems and questions which students are required to answer by the use of formulas and other spreadsheet tools. A real-world approach may be more successful in engaging students with the subject, if they can recognise the business problems being addressed and the benefits of applying appropriate data tools to such problems.

In doing this, it is not being suggested that adopting a real-world approach rather than a more structured textbook-style problem and solution approach is intended to make the subject of data literacy easier. However, recognition that the world of data literacy encompasses more than a simple study of statistical problems in Excel could serve to engage students and also more accurately represent the use of data literacy tools in real business life.

The first element of a real-world approach to the subject of business data is for students to begin to recognise that business problems are generally not structured. They are unstructured, complex and the data associated with them can also be unstructured and complicated. Hoerl states that most textbook statistical problems are narrow and well-defined with one clear solution demonstrating the technique being illustrated in the book chapter. Conversely, most real “Big Data” problems are large, complex, and unstructured using data from a range of sources addressing a fundamental problem which are frequently not clear. (Hoerl & Snee, 2017).

It is not suggested here that undergraduate students are exposed to data sets which are so complex that they are overwhelming to deal with, but a real-world approach would introduce them to the idea that data is complex, and that it is necessary to apply creativity to arrive at appropriate solutions to problems. Applying this creativity and not insisting on one “correct” answer to a problem may be one way to engage

students in the process. Using actual real-world data or data collected by the students themselves would also allow them to feel a connection to the data rather than viewing data as something which is just created to demonstrate the use of software tools and techniques (Carlson & Stowell Bracke, 2015; Green et al., 2015)

Having explored and recognised the necessity for a more real-world approach to make undergraduate data literacy modules more engaging and relevant to undergraduate business students, this thesis identifies suggested techniques for teaching and assessment practice which will be explored in the recommendations chapter.

To recap on the importance of a real-world approach to data literacy teaching, there are several issues which need to be recognised when considering taking this approach. These are:

1. It is generally recognised that work placements are extremely useful in helping students to gain useful professional skills, including data literacy skills.
2. Most business students do not go on placement, so it is extremely valuable for them to be exposed to real-world business scenarios in which to develop these skills during their time on campus.
3. Current Higher Education standards emphasise the importance of analytics and use of real-world experiences in the business curriculum.
4. Nowadays, real-world business data sets are large, complex and unstructured and problems do not generally have one easy solution. This is not replicated in the teaching of data literacy modules which are usually based on statistical examples which are focused and structured with one clear answer.

In the final section of this chapter, I will look at my fourth key theme, which will use elements of each of the other sections to explore the locating of data literacy subjects throughout the entire undergraduate student experience.

6.2.4 Embedding data literacy skills throughout the undergraduate curriculum

There is little mention in academic literature of the need to embed data literacy skills throughout all years of the data literacy curriculum. However, the adoption of an "all years" approach is implicit in the other aspects of data literacy teaching which have been examined throughout 6.2. If the teaching of data literacy subjects is to focus on real-world issues and an appreciation of the importance of a range of data literacy tools in the management of these issues, then it is not sensible to concentrate the teaching in one year, or one Semester. Data literacy teaching which starts at Foundation Level and continues up to Level 6 should help to foster the "lifelong learning mindset" described by AACSB, thus allowing students to become comfortable with current and emerging technologies. (AACSB, 2020). This is vital in the fast-moving world of business where data tools are constantly changing, improving and also becoming more complex. A one semester module delivered at Level 4 is not enough to begin this process of developing such a mindset and as such, is likely to put students at a disadvantage when they graduate and enter employment.

This is a strong theme emerging from my interviews with Level 6 students. A number of these student interviewees who had been out on placement commented that one of the reasons that they felt disadvantaged with regard to the use of Excel when they started on placement was the fact that they had forgotten most of the Excel content they had been taught in the First-Year module. Academic interviewees also commented on the disadvantage that students faced at Level 6 regarding data collection and analysis for their Dissertation and Management Enquiry purposes. Level 4 students did not generally have opinions in this area, but several said that they felt they had already forgotten most of the content of the BM9400 module, having only really learned if for the exam.

Of the eight Business Schools examined in my sectoral analysis, all apart from the University of South Wales concentrated their data literacy teaching (defined as a module concerning methods of quantitative analysis in Chapter 3) at Level 4. The University of South Wales covers the subject in a Level 5 module, with very similar content to the material covered by all the others at Level 4. Some of the Business Schools offer Research Methods modules at Level 5 and Royal Holloway offers an

optional Business Data Analytics optional module at Level 6. All modules offered by all Business Schools are 20 credit single Semester modules.

Another issue to be considered in the context of data literacy teaching and the curriculum is the necessity for students to have some data literacy skills which can support the original research that they undertake as part of their dissertation at Level 6. This issue was raised by both Level 6 students and academic staff in my interviews in the context of questionnaire design and analysis. There was general agreement that skills in this area are lacking, even in students who have undertaken a placement. Such students have generally not been required to actually collect data as part of their placement role and in this aspect, they are at the same disadvantage as students who have not been on placement.

It is recognised that the Undergraduate dissertation is a critical part of degree programmes as it allows the students to learn and develop research techniques and methodologies for dealing with specific data sets (Rodríguez-López & Souto, 2019). In the context of business and management students, this engagement with their own data sets is an intrinsic part of the development of an understanding of real-world business data. It is therefore critical that students have the skills to deal with the data they have collected as part of their dissertation research in a way which enables them to critically examine their selected topic. If they are not introduced to these skills before actually embarking on the dissertation, it is likely that they will find the data collection and analysis part of their project to be difficult and stressful, building on any anxiety about quantitative subjects which was present at Level 4.

In summary, this concentration of data literacy content at Level 4 and in single Semester modules does not seem to promote the building of technological agility as defined by AACSB or to meet the numeracy and research requirements of the QAA standards. In addition to this, Level 4 generally is not included in a student's overall degree classification, so there is a perception that modules studied in First Year do not "count". This encourages a view from students that they only need to pass with minimum marks and then they can forget about the module altogether. Academic staff interviewed were of the opinion that this was one of the major issues associated with only teaching the subject at Level 4 and then not addressing it in later modules, to any significant degree.

Examination of the three previous key themes discussed in this chapter, a picture is developing of the issues which contribute to the difficulties encountered in data literacy education at the undergraduate level. If we accept that students are reluctant to engage with the traditional, quantitative approach of using structured problems to be tackled using Excel we can understand that students would prefer to simply “get through” their Level 4 module and move onto the rest of their degree.

This approach, however, does not allow for the development of technological agility or the numeracy and research standards put forward by QAA and AACSB. The research has shown that to meet these standards, students need to develop an understanding of data and an ability to manage and analyse it in order to make a contribution to their placement companies in their third year (if they go out on placement) and to collect, analyse and present their own data as part of their dissertation at Level 6. They need to engage with all components of the data literacy and have experienced all of them by the time they graduate.

Not only do students need to develop these data literacy skills, but there is a need to build on them as they go through their degree programmes so that they can cope with the milestones of placement, dissertation and ultimately employment. To recap, the main issues associated with the importance of embedding data literacy skills within the whole undergraduate business curriculum are as follows:

1. Studying a module with data literacy content only at Level 4 fosters the impression that the module is “not important” and “doesn’t count”. Anxiety regarding numbers may already be present in a significant number of students when they join the module. If this is exacerbated at Level 4, a resistance can build up which affects the rest of the student’s university experience.
2. Such a narrow approach to data literacy teaching and learning does not foster a lifelong learning mindset, which is extremely important for future success in using data literacy tools in the business workplace.
3. Concentration of data literacy teaching at Level 4 makes it more difficult for students to develop and use research-focused data literacy skills in their Final year dissertation modules.

6.3 Summary of themes

This chapter has concentrated on the identification of four key themes arising from the interview data which was analysed and discussed in Chapter 6 and also informed by literature and sectoral and institutional analysis. These four key themes are fully described in Table 6.1. Discussion of these themes has resulted in the identification of a set of determinants contributing to an overall picture of an undergraduate data literacy curriculum which does not help students to gain the skills necessary for employment in this area. These issues are identified as follows:

- Weak student data literacy skills – associated with a variety of factors, including learning styles, teaching methods and module content.
- Over-emphasis on Excel as the main teaching tool.
- Lack of real-world business content
- Concentration of data literacy modules at Level 4 with the subject area being largely disregarded in subsequent years.

Given the importance of data literacy subjects identified by a range of standards bodies, including AACSB and QAA plus the comments made by my interviewees from all stakeholder groups, it is evident that these issues need to be addressed.

I will address these issues within the next and final chapter of this thesis in the form of a set of recommendations contributing to the development of current and future practice. For illustrative purposes I will also discuss the development of a single Semester Foundation module that I developed alongside a colleague at the end of academic year 2019/20. This module was delivered in Semester 1 of academic year 2010/21 and aimed to address the issues outlined above.

While making recommendations for improvement I will concentrate on the issues identified above. I will also recognise and take into consideration the aspects of data literacy teaching which I formulated in Chapter 3 as a response to the requirements of the various standards discussed in that chapter, with regard to the teaching on undergraduate business and management undergraduate degrees, these being:

1. Teaching needs to be current and Business relevant.
2. Different teaching methods need to be explored, which build upon this currency and relevance.
3. Students need to be engaged with the subject and to understand its importance.
4. Students need to be taught skills which they can build on in the workplace as changes in technology and business practice occur.

Examining the results of my research within the context of my key themes plus the requirements of the standards bodies will enabled me to identify and provide a set of robust recommendations. Discussion of the newly developed Foundation module will demonstrate how these recommendations can be integrated into practice for the Foundation year any beyond.

6.6 Recommendations

The purpose of this section is to examine the findings and conclusions of this DBA research and the construction of a set of recommendations which can be adapted into guidelines for the successful delivery of undergraduate data literacy modules at Newcastle Business School.

Specifically, this section will address my Research Objectives, aligning recommendations with the work done in the thesis on addressing each objective. Finally, the recommendations will be evaluated in the context of my overall Research Question:

Data Literacy Skills – why are they so important for graduates? What can Business Schools do to improve the current situation.

The first part of this question is addressed by the fulfilment of Research objectives 1-6, while the final part is dealt with by Research objective 7

6.6.1 Recommendations aligned to research objectives

6.6.1.1 Research Objective 1

RO1: To fully explore the concept of data literacy in the context of the employability of Business and Management students

This work was conducted via an extensive literature review, an analysis of educational standards and frameworks and an investigation of current modules taught in a range of Business Schools in the UK.

The starting point of the Literature Review was an historical perspective, beginning with an examination of the period when end-user computing became significant, as the personal computer was invented and business computing began to move from the era of data-processing to the era of information technology (Earl, 1989). I felt this was important, as a wealth of theories and frameworks were developed during the 1980s and 1990s (Bergeron et al., 1990; T. P. Gerrity & J. F. Rockart, 1986; McLean & Kappelman, 1992; Rockart & Flannery, 1983) These attempted to position end-user computing within the sphere of organisational computing, recognising its importance in a rapidly-changing world.

I believe that the literature around the subject of end-user computing was vital to my investigation as it laid down a framework for the consideration of computing tasks and activities which take place in end-user departments. In the modern world of Big Data, with the emphasis on data management and analysis as key tasks in the pursuit of competitive advantage, it seems clear that data literacy is a vital skill for those working in end-user departments. Given the range of jobs that Business and Management graduates take up, I was also of the opinion that they fall very much into the category of end-users, participating in data-orientated tasks as part of their work.

I then turned my attention to literature relating to big data, business intelligence, under the umbrella heading “The Information Age”, with a view to positioning these “modern” end-users within their organisations, hoping to explore similar frameworks in the context of the types of employees that Business and Management graduates are likely to become. However, this was where I encountered a gap in the literature. There is a wealth of literature dealing with technological developments during the 21st Century with a particular concentration on the use of Enterprise systems built on Big Data (Zelm, 2018), Data Analytics (Rialti et al., 2020) and Business Intelligence (Turban, 2013). However, within this literature there is a concentration on the technology, with little discussion about the people who are actually involved in using this technology. There is some consensus that these people can be identified as “Knowledge workers” although this is a broad definition and there is general agreement in literature that the term is difficult to define (Surawski, 2019). There is no real mention in this literature of the value of data literacy skills (either implicitly or explicitly), although given the concentration on the technology associated with data, it is evident that these skills are vital.

This gap is interesting, and by existing, offers potential research opportunity. Its discovery leads towards the potential for me to discover more about the concept of data literacy as it applies to Business and Management graduates in my primary research. The first part of my Literature Review certainly aided my understanding of the overall business computing landscape as it developed over the past 40 years.

The second part of my literature review was concerned with an exploration of data literacy skills as they apply to the employability of Business and Management

graduates. I began this with a short investigation into the characteristics of this group of graduates. The majority of them could be classified as being part of the generation defined as Generation Z (Mintel Group, 2018), also often referred to as Digital Natives (Prensky, 2001), given their years of birth. Young people who fall into these categories are the first generation to grow up in a world of freely available technology. As such they are very proficient with mobile phones and a wide range of other “gadgets” as such things have always been available to them. I was interested to discover if this facility with technology in general also improved the data literacy skills of these digital natives, but there was an absence of literature in this area. Again, this enabled me to identify an area for further exploration within my primary research.

I next engaged with a range of employability models (Bridgstock, 2009; CBI/NUS, 2011; Dacre Pool & Sewell, 2007; Yorke, 2004) in an effort to discover how important data literacy skills are in the context of graduate employability. A number of these models have existed for a number of years, but they are seminal in that they inform current thinking with regarding to the importance of employability as a graduate outcome and its embedding within the curriculum. While such models are extremely comprehensive, they tend to focus on soft skills and personal attributes rather than specific capabilities such as data literacy. They all mention the need for “basic IT skills” but in a very general way, with no mention of anything related to data. This is very much in line with the content of the 21st Century Leaders report commented on in Chapter 1 (Chartered Association of Business Schools, 2018) and points to another gap in literature, leading to a conclusion that data literacy skills are not considered to be part of the Higher Education employability agenda, even though such skills are so important to modern business operations. This concluded Chapter 2 with another area for consideration in my primary research.

I continued to address Research Objective 1 in Chapter 3, continuing on from the Literature Review by carrying out a general investigation of general Higher Education policy with regard to Teaching and Learning. I decided to do this by carrying out an examination of three frameworks with information available in the public domain. These were:

1. QAA (Subject benchmark statement for Business and Management)

2. AACSB
3. Teaching Excellence Framework

I was not examining these frameworks in the specific context of data literacy, as this is not their focus. Instead, I was concerned with the establishment of some principles and the building of some theory around how these frameworks could be applied to the teaching of data literacy as a subject area.

The principles that I established with regard to this subject area in the context of the frameworks examined were as follows:

5. Teaching needs to be current and Business relevant
6. Different teaching methods need to be explored, which build upon this currency and relevance
7. Students need to be engaged with the subject and to understand its importance

I then went on to complete Chapter 3 and Research Objective 1 by undertaking a review of the data literacy content within Business and Management degrees offered at a selection of UK Universities. The purpose of this was to evaluate these degree programmes against the principles established above and to determine issues of interest and concern related to data literacy modules which could then be further explored in my primary interviews. These were identified as follows:

1. Length of modules
2. Level of modules
3. Module content
4. Student engagement with modules
5. Use of Innovative teaching
6. Links to current business practice

This concluded Research Objective 1, resulting in a thorough appreciation of the concept of data literacy in the context of graduate employability. Conclusions emerging from this Research Objective established the basis of a series of broad priori themes which informed the structure of primary research interviews, leading to the achievement of Research Objectives 2, 3 and 4 and 5.

6.6.1.2 Research Objectives 2 to 5

I am dealing with these objectives collectively in this section, as they were all achieved by the development of suites of interview questions for different stakeholder groups and the execution of these corresponding interviews conducted with four groups of stakeholders, leading into Research objectives 6 and 7. It was important to identify them as different objectives, as the focus was different for each of the stakeholder groups, but the objectives were addressed in the same manner for all groups, via the medium of semi-structured interviews. These are the Research objectives, as listed in Chapter 1 and explained in detail in Chapter 4.

RO2: To explore the views and opinions of employers, regarding the data literacy skills of graduates and how well these meet the requirements of their own organisations.

RO3: To explore student experiences, views and opinions on their own skills (or lack of such) in respect of this area.

RO4: To explore the views and opinions of Academic staff on student skills in this area.

RO5: To explore the views and opinions of both students and Academic staff as to the ways in which subjects which fit into the data literacy category are taught, in terms of both content and delivery.

In order to address these Research objectives, questions were designed which formed the basis for interviews with each of the stakeholder groups. These interview questions were linked to themes developed from the Literature Review and associated with relevant literature. The list of questions, with associated narrative and sources can be found in Appendix 9, 10 and 11, as described above.

Themes arising from the Literature Review which enabled the creation of a useful set of questions were as follows:

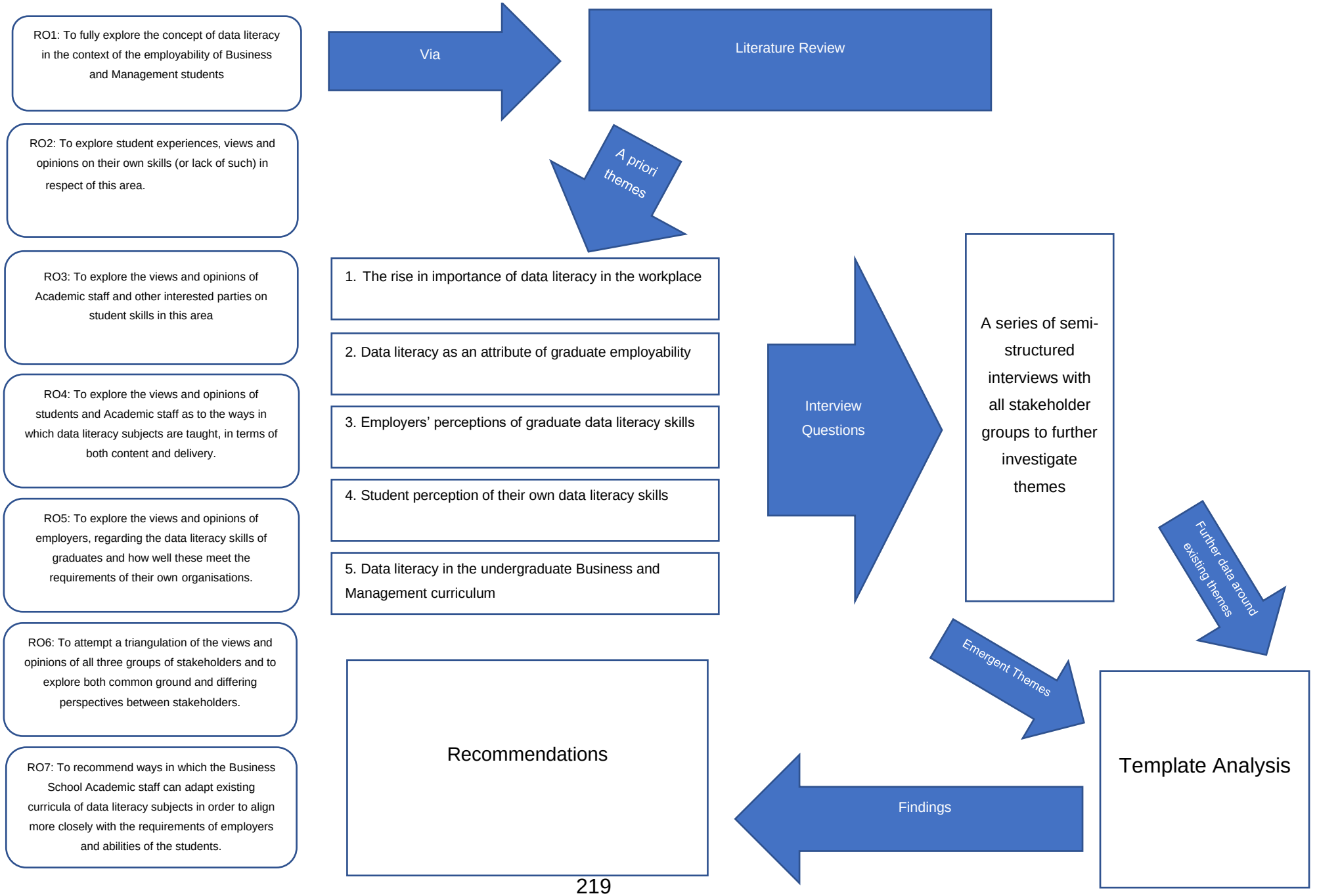
- Theme 1: The rise in importance of data literacy in the workplace
- Theme 2: Data literacy as an attribute of graduate employability
- Theme 3: Employers' perceptions of graduate data literacy skills
- Theme 4: Student perceptions of their own data literacy skills

- Theme 5: Data Literacy in the undergraduate Business and Management curriculum

These themes and their relationship with my Research Objectives are outlined in detail in the Research Roadmap (Figure 4.1).

This has already been presented in Chapter 4, but it is useful to repeat here.

Research roadmap repeated from Chapter 4 (Figure 4.1)



At this point, it is worth returning to my methodological approach to this study. I was extremely committed to a qualitative approach, as I believed that this would result in a set of data which was both rich and thick (Dibley, 2011). As explained in Chapter 4 I also consider myself to be a double-insider (Adriansen & Madsen, 2009) which means that I am an “insider” in terms of both my research subject and also my interviewees. In terms of the subject, I fall into the insider category as this subject area is where I have spent all my working life, both as a practitioner and an academic. In terms of interviewees, this insider position meant that I was able to engage in meaningful dialogue with all of them from different perspectives which led to the collection of a wealth of valuable data. Overall, I conducted 39 interviews, with four groups of stakeholders, as follows:

- 13 Employers
- 13 Level 6 students
- 10 Level 4 students
- 3 Academic staff members.

Although the concept of data saturation varies from study to study (Patricia I. Fusch & Lawrence R. Ness, 2015) I am confident that I reached this point with the first three groups of stakeholders. By the last interview in each group there was no more data and no more emergent themes. There are fewer interviews with the Level 4 students, partly because they were harder to reach. However, they also had less experience of the subject and therefore less to discuss, so data saturation was achieved earlier. With regard to the academic staff, I would have liked to have carried out more interviews, but the small teaching team made this difficult. This is a limitation of the study and also an area for further research, discussed later on this chapter.

Research objectives 2 to 5 were fully achieved by conducting these interviews resulting in data which could be considered to be both “rich” and “thick” being high in in both quality and quantity (Dibley, 2011) and achieving data saturation with all stakeholders.

6.6.1.3 Research Objective 6

To attempt a triangulation of the views and opinions of all three groups of stakeholders and to explore both common ground and differing perspectives between stakeholders.

As stated in Chapter 4 I approached this Research objective from a perspective of Data Source Triangulation, this being the collection of data from different types of people by interview (Carter et al, 2014)

Using this method, I was able to fully explore the data as described in Research objective 5. Using the Template analysis method (King & Brookes, 2017) I used the a priori themes which arose from the Literature Review as my starting point and then coded each theme into a series of sub-themes emerging from the interviews. These themes are fully described in Chapter 5**.** I explored each theme and sub-theme in detail, illustrating each one with quotes from relevant stakeholders. This proved to be a very powerful way of examining the data. A strong narrative emerged from each of the sub-themes which clearly demonstrated the thoughts and opinions of all stakeholders. A great deal of common ground was realised and there were not many differing perspectives. The main one of these was the difference of opinion between students and academic staff regarding the difficulty of using Excel. Staff were consistently surprised at how much students struggle to learn spreadsheets while many students professed to find the content of the BM9400 module (Business analysis for Decision Making) too difficult to cope with.

Analysis of the results of the interviews discussed in depth in Chapter 5 led to the development of a set of key themes which were used as the basis for recommendations (Research objective 7).

I will use these four key themes as the rationale for overall recommendations to Newcastle Business school in the area of improvement of undergraduate data literacy skills, in line with the second part of my Research Question.

6.6.1.4 Research Objective 7

To recommend ways in which Newcastle Business School can adapt existing curricula of data literacy subjects in order to align more closely with the requirements of employers and abilities of the students

Recommendations will be initially formulated by revisiting a framework developed by Race and introduced in Chapter 4. In this final chapter the framework will be modified to include synthesis with Key themes and Research objectives. A series of final recommendations will then be made, addressing the second part of my overall Research question:

"Data Literacy Skills – why are they so important for graduates? What can Business Schools do to improve the situation?"

Table 6.2 Recommendations linked to key themes and ROs *Adapted from (Race, 2015)*

		Links to Key themes and Research Objectives
Why	…are students and graduates struggling with data literacy related subjects.	Examination of Literature (RO1) identifies that current graduates can be considered to be "digital natives" Their learning styles are different and their aptitude for technology does not translate into Data Literacy skill (Key theme 1). Concentration on Excel (Key theme 2) does not "play to their strengths" as it often involves "passive" learning and is not collaborative. Issues with "mathematical anxiety" are barriers to learning data analysis concepts within Excel. Students initially approach the technology side of workshops with confidence, but quickly lose this confidence when they realise that they will be using Excel and "doing maths"
What	…should the content of data literacy teaching material consist of?	All stakeholder groups stressed the importance of a focus on real-world business issues (Research objectives 2 to 5). Key theme 3 stresses the importance of content which addresses this. Material should not concentrate purely on Excel (Key Theme 2) but should make students aware of the importance of data in business. Excel can be used to give students some practical experience of data literacy type tasks, but it should be stressed that other tools are used in business (Key theme 2). Students should be encouraged to overcome their anxiety around spreadsheets and numbers, using this practical approach. If this is done well and their confidence with the tools increase, their technological confidence could really help them to progress to a level where they really can use data analysis to produce information which can address business problems.
Who	..should teach the subject. What lecturer skillset and delivery styles are suitable to the subject?	Academic staff interviewed were generally not impressed with the data literacy skills of the undergraduates (Research objective 5). To successfully overcome the barriers of teaching a population of digital natives (Key theme 1) staff need to be open to the idea of innovative methods of teaching (not just traditional lectures and seminars. They also need to demonstrate a commitment to the development and teaching of real-world business content (Key theme 3)
Where	…should the learning take place?	Practical environments should allow students to work with data "hands-on". Mimimise formal lectures and teach theories and principles as part of practical sessions, thus capitalising on the undergraduates' skills in multitasking and collaboration (Key theme 1).
When	…should the learning take place? Is one module in First Year enough, or should the subject be	Very importantly, the learning should take place at all levels of undergraduate education (Key theme 4). This was a key finding from my institutional analysis and interviews. Most Business Schools seem to offer a module which I have defined as data literacy as a one Semester module at Level 4 and this is currently true at Newcastle Business School. Student interviewees felt that this was not enough (Research objective 3) and that it did not prepare them for placement and/or employment.

	dealt with throughout the undergraduate curriculum?	
How?	… should the learning be delivered?	The learning should be delivered in a way which engages the students with the idea that data is vital to business. It should be taught by way of business-focussed examples in a practical environment that encourages hands-on practice with “real” data.

6.6.1.5 Overall Recommendations

As stated at the beginning of this chapter, the first part of my research question has been addressed by all work done in addressing Research objectives 1 to 6. Overall recommendations addressing the second part *"What can Business Schools do to improve the situation?"* can now be made. Table 6.2 sets the framework for the development of these recommendations, which are summarised in Table 6.3.

Table 6.3 Recommendations

Recommendation 1	Diverse and innovative methods of teaching should be employed in the teaching of data literacy skills
Recommendation 2	Teaching should incorporate real-world business scenarios and data
Recommendation 3	Students should be introduced to a range of data literacy tools, rather than a sole focus on spreadsheets
Recommendation 4	Elements of data literacy should be introduced at all undergraduate levels

These recommendations were instrumental to the development of a suite of modules developed to be delivered across the Undergraduate Business curriculum, starting with a Level 3 module in Academic year 2021. Table 6.4 summarises these modules, demonstrating how each level prepares students for the next level and how each module links to preparation for employment.

All three modules are single Semester compulsory modules across all Business Programmes. There is no specific data literacy module at Level 6 as Data Literacy teaching will be embedded within the 40-credit "Capstone" module.

Module Descriptors for the three modules can be found in Appendix 14, 15 and 16.

Section 6.7 describes the level 3 module in detail, as it has already been delivered in Semester 1 of academic year 2020/21. Areas where recommendations were applied are highlighted in this case study.

Table 6.4 New Undergraduates modules

Level 3 NX9310 Business Information Management		
Summary of module and potential skills development	**Preparation for next level**	**Preparation for employment**
This module is offered as part of the Foundation Programme for students who have entry qualifications just below those required for direct entry onto a degree Programme. Success in this Programme guarantees them entry onto Level 4 of their chosen Business degree. This module was developed in recognition of the fact that students would probably have limited existing skill. It was important not to replicate content which will be covered in the Level 4 module as not all students join the Business School at Level 3. Key points of this module are to develop an understanding of the importance of data and information in business, where data can be found and simple ways of analysing and presenting this data to good effect in the business context. Use of a case study using a scenario of a business which is likely to be familiar to the majority of students. **Potential skills development** Understanding of the importance of data to business. Recognition of the characteristics of Secondary and Primary data and ethical considerations of primary data collection. Preparing simple data sets for analysis, performing simple analysis and communication of results in a business-appropriate manner.	Participation in in this module should help to counteract some of the mathematical anxiety and anxiety around Excel, which were apparent from student interviews. The gaining of an appreciation of the importance of data management, analysis and presentation plus experience of the simpler tools should prepare Level 3 student well for the introduction of more complex tools offered by the Level 4 module	Recognition of the wealth of data available both externally and internally to a business and how proper management and analysis of this data can transform it into valuable information. Development of skills in the effective and appropriate communication of information to a business audience.

Level 4 BM9403 Business Analysis for Decision Making		
Summary of module and potential skills development	**Preparation for next level**	**Preparation for employment**
This module was developed to meet the needs of students joining as direct entrants, or through the Foundation Programme. The focus on understanding the importance of data and information needed to be reiterated without too much repetition for those who had already studied the Level 3 module. This module introduces more complex tools then those examined on the Level 3 modules, including the concepts of data modelling and forecasting. Students work with more complex and varied data sets and learn about interpretation and presentation of complex information to a business audience. **Potential skills development** Understanding of the importance of data for business. Confidence with building models using complex data sets and using such models for forecasting and business decision making. Presenting this information in a business-appropriate manner.	Confidence with a range of data analysis tools will allow students to move onto Level 5 with a better understanding of appropriate tools to use when carrying out their own research. They will understand the value of selecting the right tools to address their own data analysis needs and use this knowledge to inform research planning activities.	Understanding of a range of data analysis tools used in business to provide necessary and useful information. Being able to carry out tasks associated with forecasting, interpretation of information and business decision making. Ability to use appropriate tools to display and present information derived from complex data sets to a business audience.

Level 5 BM9501 Business Research and Analysis		
Summary of module and potential skills development	**Preparation for next level**	**Preparation for employment**
This module introduces students to a range of methods which will allow them to collect data and carry out their own analysis. This will build upon data management and analysis tools introduced at Level 4, but the focus will be on data collected by the students themselves. There will also be a consideration of the role of ethics at all stages of a research project. Students will be introduced to both quantitative and qualitative methods. Quantitative data will be analysed and presented using tools already introduced at Level 4 plus additional tools associated with quantitative research. **Potential skills development** Students will develop skills in data collection and analysis to support their own research projects. They will develop skills in questionnaire design and the analysis and presentation of data collected through questionnaires. They will also be able to differentiate between quantitative and qualitative research and appreciate the best approach for specific types of projects. They will be able to create a detailed research plan to address an area of interest.	This module will prepare students for their Level 6 “Capstone” module where they are required to carry out original research in terms of a Dissertation, Management Enquiry or Consultancy Project. They will be able to distinguish between quantitative and qualitative approaches and select the appropriate approach for their own projects. The assessed component of this Level 5 module is a Research plan which they will be able to use as the basis for this original research. This plan will guide them towards appropriate methods of data collection, analysis and presentation of data in their final piece of work. They should be ready to demonstrate all the skills which contribute towards the Universities UK definition of data literacy in this piece of work “Research design, data collection, data management, data analysis, modelling, interpretation and the presentation of research findings” (Universities UK, 2015, p1)	Students will be prepared for collecting and assimilating data within the workplace, either on a work placement or in graduate employment. They will understand the ethical implications of collecting data in the workplace and will have an awareness of the appropriate tools to use for the analysis and presentation of this data

6.7 Case Study – Business Information Management Level 3 Module

6.7.1 Background

Newcastle Business School has redesigned all their Business Programmes and the first intake to the new programmes will be in Semester 1, Academic year 2021/22. Programme and Module specifications have been written and approved. Myself and a colleague have worked on specifications for data literacy modules for all levels of the Programmes, starting with Level 3, which had its first intake in this Academic Year 2020/21. The aim of these modules is to build data literacy skills year on year, including both research data and business data skills.

As the Level 3 module is the only one which is currently "live" it is the only one for which all content has been developed and delivered. The module is now complete and assessment has taken place. In this section of my final chapter I intend to outline the content, delivery and assessment relating to this module. A Full module descriptor can be found in Appendix 14.

6.7.2 Approach

When my colleague and I began developing the content for this module, we started from the definition of data literacy outlined by Universities UK and already referred to several times in previous chapters:

"*Research design, data collection, data management, data analysis, modelling, interpretation and the presentation of research findings*" (Universities UK, 2015, p11)

We decided to use elements of this definition as a template for the module, ending up with the presentation of research findings as an assessed report. We also decided to take a case study approach, writing a short case study which was referred to throughout the twelve weeks of the module (*Recommendation 2*).

The case study can be found in Appendix 13. We deliberated for a while over the subject for the case study as we wanted to create something which was sufficiently "real-world", but which would also be interesting to the students. We finally decided on a small independent gym which we called "FitFace". The proposition that we put to the students was that this gym wanted to become more "Data Savvy" and use data to help them grow and improve. With this as a starting point we developed sessions for each week which took the students through a series of steps, loosely

based on the data literacy definition above. We provided theoretical and practical "how-to" videos demonstrating the use of Excel (*Recommendation 1)*. It is important to note that we made it clear at all points that Excel was not the only tool available and that businesses often use other tools, including off-the-shelf and bespoke software packages *(Recommendation 3)* We also developed an online workshop each week where students were given additional information and tasks to do either individually or in breakout groups (*Recommendation 1).* Some of these tasks were discussions and others were spreadsheet tasks carried out individually.

6.7.3 Content and Delivery Structure

These are the various stages of the module as it was taught. Each stage took two weeks, apart from the first and last weeks. See Table 6.5 for structure:

Table 6.5 Business Information Management Content and Delivery Structure

Week	Content
1	Introduction to Module and Business Information Management
2 and 3	**Data Education** Introduction to Data & Information Management: sources; data types; storage; accessibility. Distinguish between data generated by a business and that which may be gathered from research and be used in business decision making
4 and 5	**Data Collection** Introduction to the ways in which businesses may collect data. Survey design and distribution methods
6 and 7	**Data Preparation for Analysis & Visualisation** Working with Excel to populated spreadsheets with survey data. Introduction to data analysis.
8 and 9	**Data Analysis & Presentation** The transition of data to business information. Presenting information / intelligence in Business Reports and presentations
10 and 11	**Communicating Information and Intelligence** Presenting information and intelligence face-to-face
12	**Revision and Assignment support**

6.7.3 Research Design and data collection

After delivering theoretical material on the subject of research design and questionnaire data we gave the students a spreadsheet containing 200 dummy

questionnaire responses from a survey supposedly given to FitFace's clients. We also asked them to create some additional questions and add more dummy data in response to these questions on their copy of the spreadsheet. These spreadsheets were used for the rest of the module. (*Recommendation 2, Recommendation 3)*

We also asked them to search for external data on the Internet, including numerical content. They came back with a range of data including gym membership data, health and fitness data and data about nutrition. We discussed this data as a class. (*Recommendation 1, Recommendation 4)*

6.7.5 Data management

We introduced them to the concept of "data cleansing" in their Excel spreadsheets, explaining some database theory about records and fields. We also taught them how to sort and filter data and how to use simple formulas to derive additional data from the spreadsheet data they already had (simple date arithmetic, =Count, =Countif, =Average etc.) and generally getting to understand their data.

6.7.6 Data analysis

This involved some theory about the importance of analysing data and the idea of turning data into information. We also introduced them to some more Excel tools including =IF, Pivot tables and charts.

6.7.7 Modelling and Interpretation

After some theoretical discussion about interpreting data to aid business advantage we asked all students to deliver a two-minute "elevator pitch" about their findings from the FitFace questionnaire, outlining which findings would be the most useful to FitFace and how they would help them to grow and improve their business. (*Recommendation 1)* This activity formed the basis for their assessed report. They were required to submit a one-page executive summary for this report after their elevator pitch as a formative exercise. We split the students into breakout groups and allowed them to pitch to their group plus a tutor, so that they were not intimidated by having to present to the whole group. Tutors gave feedback individually to each student in the breakout groups and then gave general feedback to the whole group (*Recommendation 1)*. Again, students were keen to participate.

6.7.8 Assessment

Students were required to submit a 2,000-word business report at the end of the Semester. The aim of this report was to outline ways in which FitFace could use the data collected to grow and improve their business. Students were invited to make recommendations for action, based on the dummy findings and to back up these recommendations with embedded tables and charts (Recommendation 2). See Table 6.6 for breakdown of assessment results:

Table 6.6 Marks Breakdown – Level 3 Business Information Management module

Total Submissions	101
Total Pass (40% and over)	91
% Pass rate	90%
Lowest Mark	0
Highest Mark	81
Average Mark	55
Breakdown	
Marks	No. Students
Below 40	10
41-50	19
51-60	30
61-70	29
71-80	12
Above 80	1

6.7.9 Summary

The results at the end of this module were extremely encouraging and are one measure of the success of the module. The approach taken to the design and delivery of the module will also be applied to further modules currently being designed for further years with a view to stretching and building student skills over the whole of their degree Programmes.

6.8 Chapter Summary

This chapter has fully discussed the development and applications of themes, synthesised from a comprehensive literature review, sectoral and institutional analyses and the analysis of primary data collection from four different stakeholder groups.

Recommendations have been made, linked to Research Objectives and the overall Research Question:

"Data Literacy Skills – why are they so important for graduates? What can Business Schools do to improve the situation?"

These recommendations have been applied to a "live" Level 3 module, with successful outcomes. In terms of the Research Question, the first part has been addressed in Chapters 1, 2 and 3 with the second being addressed in Chapters 5 and 6.

In the final part of this chapter and the thesis, contributions to knowledge and practice, considerations for future research and my development as a researcher will be discussed.

6.9 Summary of contribution to knowledge

One of the main contributions to knowledge made by this DBA research is in the recognition of data literacy as a fundamental business skill. Recognising this means that it is imperative that our Business and Management graduates have this skill when they enter employment at graduate level.

Digital literacy is identified by a variety of bodies, including the UK Government and the Learning and Work Institute as a vital component of both personal and business success (UK Department for Education, 2021; Learning and Work Institute, 2021). It is, however, difficult to find a comprehensive definition of digital literacy or digital skills. Definitions range from use of the Internet at a basic level through competency with standard business packages to web design and coding. Although spreadsheets are mentioned in some definitions, there is little or nothing about data skills as part of the digital skills mix.

On the other hand, there is a view that data is a key strategic asset in business and data skills are consistently identified as key skills for business employees (Alteryx 2016; Peng, 2017). With the advent of big data analytics and business intelligence and their role in the gaining of competitive advantage, proper management and analysis of data is critical to business success. Also critical is the interpretation of data as an aid to effective decision-making. It is therefore worthy of note that data literacy skills are not defined and considered anywhere in the digital skills discussion.

The research I have carried out in this thesis has examined the concept of data literacy from a variety of perspectives (historical, educational, business and employability) in order to reach this conclusion and I believe that the lack of inclusion of data literacy in discussion of digital skills and development of strategies is an omission which really needs to be addressed. If there is a digital skills gap in the UK (Learning and Work Institute, 2021) and if high-quality management and analysis of data is a key driver of business success, this demonstrates how essential data literacy skills are as part of the digital literacy skillset of business employees. Work carried out in this thesis serves to build on definitions and discussions around this digital literacy skillset, specifically that considered in recent work such as the UK Government Digital Skills Strategy (2017), the Skills for Jobs Government White Paper (2021) and the Learning and Work Institute: Disconnected; Exploring the Digital Skills Gap report (2021). As discussed in Chapter 1, with reference to the latter report, data literacy skills are missing from the list of skills identified as both basic and advanced digital skills and this demonstrates a definite gap in the way in which digital skills are defined and considered. Data literacy skills *must* be considered as part of any discussion around digital skills for business, given the recognition of data as a valuable business asset in the modern world. Data is plentiful as well as being easily generated and stored using modern tools, but it is only useful if it is managed, analysed and interpreted well. The skills necessary to do this are therefore a critical component of the digital skillset.

I have also made a contribution to knowledge in my consideration of Business and Management graduates as they become business employees. This research has recognised that Business and Management graduates enter employment in a wide range of jobs and industries. The existing literature and my primary research leads to a perception that management and analysis of data in one way or another will form part of whatever job they do, if it is at graduate level (De Sordi, 2021)

Associated with this is the idea put forward in this thesis that “knowledge worker” is a definition which could be applied to the types of employment entered into by Business and Management graduates. Although it is accepted that the term is not generally well-defined, the list of graduate careers identified on Page 70-71 supports a description of knowledge workers as “white-collar” workers in a range of departments who are involved with the organisation and development of

organisational knowledge Surawski, 2019). Considering them in this way can inform and underpin the development of degree Programmes to include data literacy skills at an appropriate level for them to be useful to employers as knowledge workers.

My final contribution to knowledge is concerned with the institutional analysis carried out in Chapter 3 of this thesis. Assessing the data literacy content of similar modules over a range of Business Schools was a valuable exercise, generating knowledge about the overall landscape of teaching in this area. This knowledge allowed for the identification of gaps in the general institutional approach to data literature teaching in UK Business Schools. These gaps alongside consideration of literature and analysis of primary data contributed to the approach taken to the development of a new set of undergraduate modules described in 6.10.

6.10 Summary of Contribution to Practice

The main contribution to practice made by this thesis is my contribution to the development of a suite of data management and analysis undergraduate modules, referred to above. These modules are core to all Business and Management Programmes. As stated in section 6.7, this suite of modules began with the Level 3 Module which completed its first iteration in January 2021. Recommendations made in Table 6.1 were taken into account in the development of the Level 3 module as described previously.

Recommendations arising from this thesis are also included in the development of the Level 4 and 5 modules, the fact that there are modules being offered at each Level being in line with recommendation 4, that elements of data literacy are introduced at all levels of the curriculum. The Module Descriptors for the Levels 4 and 5 modules can be found in Appendices 14 and 15. As can be seen in these documents the emphasis of the modules is on the simulation of real-world tasks and scenarios with data-handling and interpretive skills content being designed to aid transferability to work or further study.

The Level 4 module is outlined on page 113. The Level 5 module is designed to build on analytical skills learned at level 4 and to refine these skills in preparation for work placement or study abroad as well as Level 6 “capstone” research modules. In this module students will learn how to develop a research question and gain an

understanding of both quantitative and qualitative data collection and business analysis techniques, using a range of appropriate software tools.

A Level 6 module currently in development will concentrate on data management and analysis tools which will enable students to undertake their capstone research. Emphasis will be on understanding and interpreting data which has been analysed using a range of software tools. Capstone modules are business-focused, and skills learned are designed to be potentially transferable to work or further study.

This suite of modules briefly described above demonstrates a commitment from Newcastle Business School to the embedding of data literacy skills in the undergraduate curriculum. A key point about these modules is that each one builds on the previous one so that students develop and improve their data literacy skills throughout their undergraduate journey. Emphasis is on both the analysis and interpretation of real-world data and also on engagement with individual original research.

It is anticipated that this approach will go some way towards engaging students in the study of data literacy subjects. A cohesive “thread” running through all years of study reinforces the idea that the subject is important and relevant, as well as building skills over time. Use of real-world data in line with AACSB recommendations again adds to the relevance of the subject as does developing skills applicable to students’ own research projects. Using real-world data and allowing students to specify and collect some of their own data was definitely successful in developing student engagement in the Level 3 module and this will be a goal of all the new modules. If students can be encouraged to appreciate the value of developing good data literacy skills to enhance both their education and future employment, this will result in benefit to the students, the Business School and the employers. If this DBA research makes a contribution to these benefits, then it can really be considered to be a contribution to practice.

6.11 Considerations for further research

This DBA study provides further opportunities for research, both in extending and adapting the study. In terms of extending the study, it would be very useful to carry out cross-institutional work, interviewing stakeholders associated with more than one

Business School. This could include those institutions identified as “close neighbours” of Newcastle Business School in the Guardian League Table and would serve to add more depth to the study. Alternatively, further work could include close geographical neighbours (Newcastle, Durham, Sunderland and Teesside). Further work carried out in this way would confirm if experiences of stakeholders are similar institutionally and/or geographically and therefore if recommendations made to Newcastle Business School are replicable.

It would also be worthwhile to extend the study in terms of Academic staff interviewed, to include additional members of staff teaching data literacy subjects as well as staff teaching other modules with data content, such as the Level 6 capstone modules. Careers and placement staff and others associated with employability could also have a useful input.

In Chapter 3 I stated that I would have like to have interviewed representatives from one complete cohort of students in a longitudinal study to evaluate how their data literacy skills and attitudes to related subjects developed over all levels of their undergraduate education. This was not possible due to time constraints of the DBA. However, it would be really valuable to embark on a piece of research at the start of academic year 2021/22 as the new Business Management Programme begins, with the set of new data literacy modules. This could compare skills and attitudes as the new modules roll out with a view to learning lessons for future iterations of the modules. Comparisons could also be made with the results of this DBA study to evaluate the success of recommendations.

6.12 Reflections on my development as a researcher

When I was first employed as a Senior Lecturer at Newcastle Business School in 2014, I identified myself very much as a business practitioner. I came from a position within the post-graduate training team at Durham University, but I had only been in this role for a year. Prior to working at Durham, I had been self-employed as an independent data management consultant and trainer for many years, and this was how I would describe myself.

I had been interested in pursuing doctoral study since finishing my Masters around 20 years previously, so I was very happy with the requirement to obtain a doctorate

when I began work at Newcastle Business School. I was particularly happy with the option to study for a DBA. The contribution to professional practice aspect really appealed to me. I felt that my business experience, coupled with the impressions I was forming about the teaching of the skill that I later came to refer to as *data literacy* provided a good topic to work with and something with which I might be able to make a difference. The research topic was very personal to me, and I felt as I moved through the research process that I was discovering more about myself and my life as I moved from business into academia. I very much wanted my voice to be heard with regard to this, which is why I made the choice to write some of the thesis in the first person.

It took me a while to get properly started. Combining my DBA with a full-time job was challenging, particularly as I took on the role of Programme Leader for what has developed to become the largest Programme in the Business School at same time as starting my studies. I also found it hard to gain an understanding of what was required of me. It was difficult to get used to academic writing after so much time away from education and I became extremely frustrated with myself. My supervisors were really committed to helping me which helped enormously but I still found it very difficult to write anything that I felt was at an appropriate standard. Writing my methodology chapter was the point at which I started to feel confidence in my abilities again. I initially thought I would carry out a quantitative study, given that my background was in spreadsheets, statistics and data analysis. However, I considered what I actually wanted to achieve from my study carefully, and it became clear that a qualitative approach would be much more appropriate. I really enjoyed discovering more about research philosophy and recognising myself as a social constructionist who was going to collect rich data by interviewing a range of stakeholders. My interviews were successful and generated some valuable data which I was really excited to analyse and discuss. I began to feel much more positive about the DBA and about academic life in general. Undertaking the DBA has been extremely useful to me in supervising Masters students and I feel really confident in advising them on research methods and data analysis in respect of both quantitative and qualitative studies. I also feel that I have been very well-supervised myself and this has given me confidence in my own supervision abilities.

Overall, I have learned a great deal from undertaking the DBA. I now feel like a much more integrated member of the academic community. Last academic year I entered the three-minute thesis competition at Newcastle Business School and came third, which gave me a great deal of confidence in my study and my ability to discuss it. I was also invited to Birmingham City Business school to talk about my experience of carrying out “insider” research in an educational context. This was well-received and helped me to think about and consolidate my approach.

I started my DBA study with a very firm idea of my identity as a business practitioner. I now consider myself to be an academic practitioner as well. It has been hard work combining doctoral study with full-time employment, but it has been immensely worthwhile.

References

AACSB. (2008). Accreditation Standards. Retrieved from http://www.aacsb.edu/accreditation/standards.asp

AACSB. (2020). 2020 Guiding Principles and Standards for Business Education. Retrieved from https://www.aacsb.edu/-/media/aacsb/docs/accreditation/business/standards-and-tables/2020%20business%20accreditation%20standards.ashx?la=en&hash=E4B7D8348A6860B3AA9804567F02C68960281DA2

Aberystwyth University. (2020). Bsc Business and Management. Retrieved from https://courses.aber.ac.uk/undergraduate/business-management-degree/

Achenreiner, G., Kleckner, M. J., Knight, P., & Lilly, B. (2019). Student Self-Efficacy, Employee Engagement, and Community Vitality: A Collaborative Data Collection Model for Regional Workforce Development. *Journal of education and work, 32*(6-7), 614-632. doi:10.1080/13639080.2019.1673889

Ackoff, R. L. (1989). From Data to Wisdom. *Journal of Applied Systems Analysis,, 16*.

Adriansen, H. K., & Madsen, L. M. (2009). Studying the Making of Geographical Knowledge: The Implications of Insider Interviews. *Norsk Geografisk Tidsskrift - Norwegian Journal of Geography, 63*(3), 145-153. doi:10.1080/00291950903238966

Alavi, M., & Leidner, D. E. (2001). Review: Knowledge Management and Knowledge Management Systems: Conceptual Foundations and Research Issues. *MIS quarterly, 25*(1), 107-136. doi:10.2307/3250961

Alteryx. (2016, 06/09/16). The 'Business Grammar' Report: A Study of European Decision-Makers' Attitudes to Data and Analytics in Modern Business. Retrieved from http://pages.alteryx.com/rs/716-WAC-917/images/Alteryx%20Business%20Grammar%20Report_06.09.16.pdf

Anderson, R. (2016). University Fees in Historical Perspective. Retrieved from http://www.historyandpolicy.org/policy-papers/papers/university-fees-in-historical-perspective

Anglia Ruskin University. (2020). Bsc (Hons) Business Management. Retrieved from https://aru.ac.uk/study/undergraduate/business-management

Basit, T. (2010). Manual or Electronic? The Role of Coding in Qualitative Data Analysis. *Educational research (Windsor), 45*(2), 143-154. doi:10.1080/0013188032000133548

Bell, E., & Bryman, A. (2007). The Ethics of Management Research: An Exploratory Content Analysis. *British Journal of Management, 18*(1), 63-77. doi:10.1111/j.1467-8551.2006.00487.x

Belotto, M. J. (2018). Data Analysis Methods for Qualitative Research: Managing the Challenges of Coding, Interrater Reliability, and Thematic Analysis. *Qualitative report, 23*(11), 2622.

Berger, R. (2015). Now I See It, Now I Don't: Researcher's Position and Reflexivity in Qualitative Research. *Qualitative Research, 15*(2), 219-234. doi:10.1177/1468794112468475

Bergeron, F., Rivard, S., & Serre, L. D. (1990). Investigating the Support Role of the Information Center. *MIS quarterly, 14*(3), 246.

Birmingham City University. (2020). Business - Ba (Hons). Retrieved from https://www.bcu.ac.uk/courses/business-studies-ba-hons-2021-22

Bridgstock, R. (2009). The Graduate Attributes We've Overlooked: Enhancing Graduate Employability through Career Management Skills. *Higher education research and development, 28*(1), 31-44. doi:10.1080/07294360802444347

British Computer Society. (2017). Autumn 2017. *IT Now*.

British Computer Society. (2017). Summer 2017. *IT Now*
.

Brockmann, E. N., & Anthony, W. P. (2002). Tacit Knowledge and Strategic Decision Making. *Group & organization management, 27*(4), 436-455. doi:10.1177/1059601102238356

Brooks, R., & Youngson, P. L. (2016). Undergraduate Work Placements: An Analysis of the Effects on Career Progression. *Studies in higher education (Dorchester-on-Thames), 41*(9), 1563-1578. doi:10.1080/03075079.2014.988702

Business2Community. (2020). 12 Striking Statistics from the 2020 Global State of Enterprise Analytics Report. Retrieved from https://www.business2community.com/business-intelligence/12-striking-statistics-from-the-2020-global-state-of-enterprise-analytics-report-02289910

Cacciolatti, L., Lee, S. H., & Molinero, C. M. (2017). Clashing Institutional Interests in Skills between Government and Industry: An Analysis of Demand for Technical and Soft Skills of Graduates in the Uk. *Technological forecasting & social change, 119*, 139-153. doi:10.1016/j.techfore.2017.03.024

Calma, A., & Dickson-Deane, C. (2020). The Student as Customer and Quality in Higher Education. *International journal of educational management, 34*(8), 1221-1235. doi:10.1108/IJEM-03-2019-0093

Calzada Prado, J., & Marzal, M. Á. (2013). Incorporating Data Literacy into Information Literacy Programs: Core Competencies and Contents. *Libri (København), 63*(2), 123-134. doi:10.1515/libri-2013-0010

Carlson, J., & Stowell Bracke, M. (2015). Planting the Seeds for Data Literacy: Lessons Learned from a Student-Centered Education Program. *International Journal of Digital Curation, 10*(1), 95-110. doi:10.2218/ijdc.v10i1.348

Carter, N., Bryant-Lukosius, D., Dicenso, A., Blythe, J., & Neville, A. (2014). The Use of Triangulation in Qualitative Research. *Oncology Nursing Forum, 41*(5), 545-547. doi:10.1188/14.ONF.545-547

Castells, M. (2010). *The Rise of the Network Society* (2nd ed., with a new pref.. ed.). Chichester, West Sussex Malden, MA: : Wiley-Blackwell.

CBI, & Universities UK. (2009). Future Fit: Preparing Graduates for the World of Work . Retrieved From: Http://Www.Agcas.Org.Uk/Agcas_Resources/104-Future-Fit-Preparing-Graduates-for-the-World-of-Work-.

CBI/NUS. (2011). Working Towards Your Future: Making the Most of Your Time in Higher Education. Retrieved from http://cced-complete.com/documentation/working_towards_your_future_eng.pdf

Chartered Association of Business Schools. (2014 p5). 21st Century Leaders

Building Practice into the Curriculum to Boost Employability. Retrieved from https://charteredabs.org/wp-content/uploads/2015/02/21st_century_leaders_june2014_-_final_report.pdf

Chartered Association of Business Schools. (2018). 21st Century Leaders. February 2018 Building Employability through Higher Education. Retrieved from https://charteredabs.org/wp-content/uploads/2018/03/21st_Century_Leaders_CMI_Feb2018.pdf?x18957

Clarke, V., & Braun, V. (2017). Thematic Analysis. *The journal of positive psychology, 12*(3), 297-298. doi:10.1080/17439760.2016.1262613

Clayton, H. R., & Sankar, C. S. (2009). Using Spreadsheets to Enhance Learning in the Affective Domain for Undergraduate Statistics Students. *Transactions on education, 10*(1), 10-17. doi:10.1287/ited.1090.0030

Connor, W. D. (1993). Organizational Effects of Downsizing: Strategies for Moving Off the Mainframe. *Information systems management, 10*(3), 30-34. doi:10.1080/10580539308906941

Costina Denisa, B. (2020, p137). Teaching the Digital Natives. *Revista de stiinte politice*(65), 136-145.

Costley, C. (2010). *Doing Work Based Research : Approaches to Enquiry for Insider-Researchers*. London Los Angeles, [Calif.]: London : SAGE.

Dacre Pool, L., & Sewell, P. (2007). The Key to Employability: Developing a Practical Model of Graduate Employability. *Education & training (London), 49*(4), 277-289. doi:10.1108/00400910710754435

David, M. E., David, F. R., & David, F. R. (2021). Closing the Gap between Graduates' Skills and Employers' Requirements: A Focus on the Strategic Management Capstone Business Course. *Administrative sciences, 11*(1), 10. doi:10.3390/admsci11010010

De Sordi, J. O., Azevedo, M. C. d., Bianchi, E. M. P. G., & Carandina, T. (2021). Defining the Term Knowledge Worker: Toward Improved Ontology and Operationalization. *Knowledge and process management, 28*(1), 56-70. doi:10.1002/kpm.1647

Denizhan Kalkan, V. (2008). An Overall View of Knowledge Management Challenges for Global Business. *Business process management journal, 14*(3), 390-400. doi:10.1108/14637150810876689

Denning, S. (2020). The Challenge: 20th Century Vs. 21st Century Management. *Strategy & leadership, 48*(6), 11-19. doi:10.1108/SL-10-2020-0127

Dibley, L. (2011). Analysing Narrative Data Using Mccormack's Lenses.(Nurse Researcher)(Report). *Nurse Researcher, 18*(3), 13. doi:10.7748/nr2011.04.18.3.13.c8458

Dickson, G. W., Leitheiser, R. L., Wetherbe, J. C., & Nechis, M. (1984). Key Information Systems Issues for the 1980's. *MIS quarterly, 8*(3), 135-159. doi:10.2307/248662

Ding, F., & Stapleton, P. (2015). Self-Emergent Peer Support Using Online Social Networking During Cross-Border Transition. *Australasian journal of educational technology, 31*(6). doi:10.14742/ajet.2305

Duxbury, L., & Ormsbee, F. (2017). Does Studying the Past Help Us Understand the Future? An Examination of the Expectations of Gen X Knowledge Workers. *The International Journal of Human Resource Management*, 1-29. doi:10.1080/09585192.2017.1393835

Earl, M. J. (1989). *Management Strategies for Information Technology*. New York London: New York London : Prentice Hall.

Easterby-Smith, M. (2012). *Management Research Mark Easterby-Smith, Richard Thorpe and Paul Jackson* (4th ed.. ed.). Los Angeles London : SAGE.

Englebretson, R. (2007). *Stancetaking in Discourse : Subjectivity, Evaluation, Interaction*. Amsterdam: Amsterdam : John Benjamins Pub.

Farashahi, M., & Tajeddin, M. (2018). Effectiveness of Teaching Methods in Business Education: A Comparison Study on the Learning Outcomes of Lectures, Case Studies and Simulations. *The international journal of management education, 16*(1), 131-142. doi:10.1016/j.ijme.2018.01.003

Fichman, R. G., Dos Santos, B. L., & Zheng, Z. (2014, p330). Digital Innovation as a Fundamental and Powerful Concept in the Information Systems Curriculum. *MIS quarterly, 38*(2), 329-A315. doi:10.25300/MISQ/2014/38.2.01

Fusch, P. I., & Ness, L. R. (2015). Are We There Yet? Data Saturation in Qualitative Research. *Qualitative Report, 20*(9), 1408-1416.

Galletta, A. (2013). *Mastering the Semi-Structured Interview and Beyond : From Research Design to Analysis and Publication*. New York: New York : NYU Press.

Gandomi, A., & Haider, M. (2015). Beyond the Hype: Big Data Concepts, Methods, and Analytics. *International journal of information management, 35*(2), 137-144. doi:10.1016/j.ijinfomgt.2014.10.007

Garavan, T. N., & McCracken, C. (1993). Introducing End-User Computing: The Implications for Training and Development - Part 1. *Industrial and commercial training, 25*(7), 8. doi:10.1108/00197859310042443

Gaston, J. (2006). Reaching and Teaching the Digital Natives. *Library hi tech news, 23*(3), 12-13. doi:10.1108/07419050610668124

Gatian, A. W., Brown, R. M., & Hicks, J. O. (1995). Organizational Innovativeness, Competitive Strategy and Investment Success. *The journal of strategic information systems, 4*(1), 43-59. doi:10.1016/0963-8687(95)80014-H

Gerrity, T. P., & Rockart, J. F. (1986). End-User Computing: Are You a Leader or a Laggard? *Sloan management review, 27*(4), 25.

Gov.UK. (2017). Uk Digital Strategy,. Retrieved from https://www.gov.uk/government/publications/uk-digital-strategy

Gov.UK. (2018). Essential Digital Skills Framework. Retrieved from https://www.gov.uk/government/publications/essential-digital-skills-framework

Graduate Prospects. (2020). Business Management. Retrieved from https://www.prospects.ac.uk/careers-advice/what-can-i-do-with-my-degree/business-management

Green, G. P., Jones, S., & Bean, J. C. (2015). Teaching Real-World Applications of Business Statistics Using Communication to Scaffold Learning. *Business and professional communication quarterly, 78*(3), 314-335. doi:10.1177/2329490615588908

Guardian, The. (2019). University League Tables 2020. Retrieved from https://www.theguardian.com/education/ng-interactive/2019/jun/07/university-league-tables-2020

Guardian, The. (2020). University League Tables 2021. Retrieved from https://www.theguardian.com/education/ng-interactive/2020/sep/05/the-best-uk-universities-2021-league-table

Hammer, D., & Berland, L. K. (2014). Confusing Claims for Data: A Critique of Common Practices for Presenting Qualitative Research on Learning. *Journal of the Learning Sciences, 23*(1), 37-46. doi:10.1080/10508406.2013.802652

Harrell, M. C., & Bradley, M. A. (2009). Data Collection Methods: Semi-Structured Interviews and Focus Groups. In: RAND Corporation.

Harvard Business Review. (2014). What Peter Drucker Knew About 2020? Retrieved from https://hbr.org/2014/10/what-peter-drucker-knew-about-2020

Harvard Business Review. (2016). The Untapped Power of Self-Service Data Analytics. Retrieved from https://hbr.org/sponsored/2016/06/the-untapped-power-of-self-service-data-analytics

HEA Academy. (2016, p1). Embedding Employability in Higher Education. Retrieved from https://www.heacademy.ac.uk/system/files/downloads/embedding-employability-in-he.pdf

Henderson, J. C., & Treacy, M. E. (1986). Managing End-User Computing for Competitive Advantage. *MIT Sloan management review, 27*(2), 3.

HEPI.ac.uk. (2019). The Placement Panacea. Retrieved from https://www.hepi.ac.uk/2019/04/11/the-placement-panacea/

Herschel, R. T., Nemati, H., & Steiger, D. (2001). Tacit to Explicit Knowledge Conversion: Knowledge Exchange Protocols. *Journal of knowledge management, 5*(1), 107-116. doi:10.1108/13673270110384455

Hodgkinson, M., & Kelly, M. (2007). Quality Management and Enhancement Processes in Uk Business Schools: A Review. *Quality Assurance in Education, 15*(1), 77-91. doi:10.1108/09684880710723043

Hoecht, A. (2006). Quality Assurance in Uk Higher Education: Issues of Trust, Control, Professional Autonomy and Accountability. *Higher education, 51*(4), 541-563. doi:10.1007/s10734-004-2533-2

Hoerl, R. W., & Snee, R. D. (2017). Statistical Engineering: An Idea Whose Time Has Come? *The American statistician, 71*(3), 209-219. doi:10.1080/00031305.2016.1247015

Holliday, A. (2016). *Doing & Writing Qualitative Research* (3e.. ed.): Los Angeles : SAGE.

Howard, A., & Warwick, J. (2016). The Prevalence of Mathematical Anxiety in a Business School: A Comparative Study across Subject Areas. *International journal of social sciences & educational studies, 3*(2), 4.

Jackson, D. (2017). Developing Pre-Professional Identity in Undergraduates through Work-Integrated Learning. *Higher education, 74*(5), 833-853. doi:10.1007/s10734-016-0080-2

Johnson, M. E., & Berenson, M. L. (2019, 215). Choosing among Computational Software Tools to Enhance Learning in Introductory Business Statistics. *Decision sciences journal of innovative education, 17*(3), 214-238. doi:10.1111/dsji.12186

Johnston, A. (2014, p208). Rigour in Research: Theory in the Research Approach. *European business review, 26*(3), 206-217. doi:10.1108/EBR-09-2013-0115

Jones, C. M., Green, J. P., & Higson, H. E. (2017). Do Work Placements Improve Final Year Academic Performance or Do High-Calibre Students Choose to Do Work Placements? *Studies in higher education (Dorchester-on-Thames), 42*(6), 976-992. doi:10.1080/03075079.2015.1073249

King, N. (2019). *Interviews in Qualitative Research* (2nd edition. / Nigel King, Christine Horrocks, Joanna Brooks.. ed.). Los Angeles: Los Angeles : SAGE.

King, N., & Brookes, J. M. (2017). Template Analysis for Business and Management Students. In (Vol. 2017). Beaverton: Beaverton: Ringgold Inc.

Kirkley, J. (1990). Is This the Beginning of the End for Is Professionals? *ComputerWorld, 24(3),* 19.

Kooy, B. (2015). Stanford Encyclopedia of Philosophy – Http://Plato.Stanford.Edu. *Reference Reviews, 29*(8), 14-16. doi:10.1108/RR-06-2015-0155

Kvale, S. (1983). The Qualitative Research Interview. *Journal of Phenomenological Psychology, 14*(1-2), 171-196. doi:https://doi.org/10.1163/156916283X00090

Lampropoulou, S., & Myers, G. (2012). Stance-Taking in Interviews from the Qualidata Archive. *Forum, qualitative social research, 14*(1).

Laugerman, M. R., & Saunders, K. P. (2019). Supporting Student Learning through Instructional Videos in Business Statistics. *Decision sciences journal of innovative education, 17*(4), 387-404. doi:10.1111/dsji.12193

Learning and Work Institute. (2021). Learning and Work Institute: Disconnected; Exploring the Digital Skills Gap. Retrieved from https://learningandwork.org.uk/resources/research-and-reports/disconnected-exploring-the-digital-skills-gap/

LLoyds Bank. (2020). Lloyds Bank Uk Consumer Digital Index 2020. Retrieved from https://www.lloydsbank.com/assets/media/pdfs/banking_with_us/whats-happening/lb-consumer-digital-index-2020-report.pdf

Macy, K. V., & Coates, H. L. (2016, p2). Data Information Literacy Instruction in Business and Public Health: Comparative Case Studies. *IFLA journal, 42*(4), 313-327. doi:10.1177/0340035216673382

Maggiti, P. (2015). 3 Critical Thinking Skills Business Graduates Need to Succeed. In. Maggitti, P. (2015, 02/06/2015). Be the Problem Solver. *US News and*

World Report. Retrieved from https://www.usnews.com/opinion/knowledge-bank/2015/06/02/3-critical-thinking-skills-business-graduates-need-to-succeed

Manchester Metropolitan University. (2020). Ba (Hons) Business Management. Retrieved from https://www.mmu.ac.uk/study/undergraduate/course/ba-business-management/?start=september-2020

McEvoy, P. (2002). Interviewing Colleagues. *Nurse researcher, 9*(2), 49-59.

McLean, E. R., & Kappelman, L. A. (1992). The Convergence of Organizational and End-User Computing. *Journal of management information systems, 9*(3), 145-155. doi:10.1080/07421222.1992.11517971

Melville, D. (1998, p9). The Future of Higher Education. *Perspectives (Association of University Administrators (U.K.)), 2*(1), 8-13. doi:10.1080/713847908

Merleau-Ponty, M. (1976). *Phenomenology of Perception*. London: London : Routledge and Kegan Paul.

Mintel Group, L. (2018). *Technology Habits of Generation Z - Uk - September 2018*: Mintel Group Ltd.

Monino, J.-L. (2016). *Big Data, Open Data and Data Development* (1st edition. ed.): Hoboken, New Jersey : ISTE Ltd/John Wiley and Sons Inc.

Morley, L., & Aynsley, S. (2007). Employers, Quality and Standards in Higher Education: Shared Values and Vocabularies or Elitism and Inequalities? *Higher education quarterly, 61*(3), 229-249. doi:10.1111/j.1468-2273.2007.00353.x

Mutch, A. (2008). *Managing Information and Knowledge in Organizations : A Literacy Approach*. New York: New York : Routledge.

Newcastle Business School. (2020). Entry Requirements 2021/22. Retrieved from https://www.northumbria.ac.uk/study-at-northumbria/courses/ba-hons-business-management-uusbnb1/

Nonaka, I. (1995). *The Knowledge-Creating Company : How Japanese Companies Create the Dynamics of Innovation*. New York Oxford: New York

Oxford : Oxford University Press.Northumbria University. (2020). Ethics and Governance. Retrieved from https://www.northumbria.ac.uk/research/ethics-and-governance/

Northumbria University. (2020). Your Northumbria Laearning Experience. Retrieved from https://www.northumbria.ac.uk/about-us/your-northumbria-learning-experience/

Open Knowledge Foundation. (2018). What Is Open Data? Retrieved from https://opendatahandbook.org/guide/en/what-is-open-data/

Opstad, L. (2020). Attitudes Towards Statistics among Business Students: Do Gender, Mathematical Skills and Personal Traits Matter? *Sustainability (Basel, Switzerland), 12*(15), 6104. doi:10.3390/su12156104

Orlikowski, W. J., & Baroudi, J. J. (1988). The Information Systems Profession: Myth or Reality? *Office technology and people, 4*(1), 13-30. doi:10.1108/eb022652

Peng, G. (2017). Do Computer Skills Affect Worker Employment? An Empirical Study from Cps Surveys. *Computers in human behavior, 74*, 26-34. doi:10.1016/j.chb.2017.04.013

Powell, A. L. (2013). Computer Anxiety: Comparison of Research from the 1990s and 2000s. *Computers in Human Behavior, 29*(6), 2337-2381. doi:10.1016/j.chb.2013.05.012

Prensky, M. (2001). Digital Natives, Digital Immigrants Part 1. *On the horizon, 9*(5), 1-6. doi:10.1108/10748120110424816

QAA. (2019). QAA Subject Benchmark Statement:Business and Management,. Retrieved from https://www.qaa.ac.uk/docs/qaa/subject-benchmark-statements/subject-benchmark-statement-business-and-management.pdf?sfvrsn=db39c881_5

QAA. (2019). The Uk's Quality Body for Higher Education. Retrieved from https://www.qaa.ac.uk/

Race, P. (13/03/2019). [10 Most Important Words in Learning, Teaching and Assessment].

Regan, E. A. (2002). *End-User Information Systems : Implementing Individual and Work Group Technologies* (2nd ed.. ed.). Upper Saddle River, NJ: Upper Saddle River, NJ : Prentice Hall.

Rialti, R., Marzi, G., Caputo, A., & Mayah, K. A. (2020). Achieving Strategic Flexibility in the Era of Big Data: The Importance of Knowledge Management and Ambidexterity. *Management decision, ahead-of-print*(ahead-of-print). doi:10.1108/MD-09-2019-1237

Richards, J., & Gottlob, G. (2017). Mining for New Knowledge in Big Data. *ITNow, 59*(3), 16-17. doi:10.1093/itnow/bwx078

Robey, D., & Zmud, R. (1992). Research on the Organization of End-User Computing: Theoretical Perspectives from Organizational Science. *Information Technology & People, 6*(1), 11-27doi:10.1108/EUM0000000003542

Rockart, J., & Flannery, L. (1983). The Management of End User Computing. *Communications of the ACM, 26*(10), 776-784. doi:10.1145/358413.358429

Rodríguez-López, Á., & Souto, J. E. (2019). Empowering Entrepreneurial Education Using Undergraduate Dissertations in Business Management and Entrepreneurship: A Five-Year Study (2012–2016). *Education & training (London), 61*(2), 255-271. doi:10.1108/ET-07-2018-0160

Rowley, J. (2007). The Wisdom Hierarchy: Representations of the Dikw Hierarchy. *Journal of information science, 33*(2), 163-180. doi:10.1177/0165551506070706

Royal Holloway University. (2020). Business and Management Bsc. Retrieved from https://www.royalholloway.ac.uk/studying-here/undergraduate/business-and-management/business-and-management/

SCONUL. (2011 p3). The Sconul Seven Pillars of Information Literacy: Core Model. Retrieved from https://www.sconul.ac.uk/sites/default/files/documents/coremodel.pdf

SCONUL. (2015). An Employability Lens for the Sconul 7 Pillars of Information Literacy. Retrieved from https://www.sconul.ac.uk/sites/default/files/documents/Employability%20lens%20and%20report.pdf

Smith, J. A. (2009). *Interpretative Phenomenological Analysis : Theory, Method and Research*. Los Angeles, [Calif.]London: SAGE.

Somogyi, E., & Galliers, R. D. (1987). Applied Information Technology: From Data Processing to Strategic Information Systems. *Journal of information technology, 2*(1), 30-41. doi:10.1057/jit.1987.7

Sun, Z., Sun, L., & Strang, K. (2018). Big Data Analytics Services for Enhancing Business Intelligence. *The Journal of computer information systems, 58*(2), 162-169. doi:10.1080/08874417.2016.1220239

Surawski, B. (2019). Who Is a “Knowledge Worker” – Clarifying the Meaning of the Term through Comparison with Synonymous and Associated Terms. *Management (Zielona Góra), 23*(1), 105-133. doi:10.2478/manment-2019-0007

Swain, J. M., Swain, & Spire, Z. D. (2020). The Role of Informal Conversations in Generating Data, and the Ethical and Methodological Issues. *Forum, qualitative social research, 21*(1). doi:10.17169/fqs-21.1.3344

technative.io. (2020). Role of Third-Party Technology Suppliers in a ‘Cloud First’ Solutions Environment. Retrieved from https://technative.io/role-of-third-party-technology-suppliers-in-a-cloud-first-solutions-environment/

Tracy, S. J. (2013). *Qualitative Research Methods : Collecting Evidence, Crafting Analysis, Communicating Impact*: Chichester, West Sussex : Wiley-Blackwell.

Trkman, P. (2019). Value Proposition of Business Schools: More Than Meets the Eye. *The international journal of management education, 17*(3), 100310. doi:10.1016/j.ijme.2019.100310

Turban, E. (2013). *Decision Support and Business Intelligence Systems* (Ninth editon.. ed.). Harlow: Harlow : Pearson Education.

UK Department for Education. (2017). Teaching Excellence and Student Outcomes Framework Specification. Retrieved from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/658490/Teaching_Excellence_and_Student_Outcomes_Framework_Specification.pdf

UK Department for Education. (2021). Skills for Jobs: Lifelong Learning for Opportunity and Growth. Retrieved from https://www.gov.uk/government/publications/skills-for-jobs-lifelong-learning-for-opportunity-and-growth

Universities UK. (2015). Making the Most of Data:Data Skills Training in English Universities. Retrieved from https://www.universitiesuk.ac.uk/policy-and-analysis/reports/Pages/data-skills-training-in-english-universities.aspx

Universities UK. (2021). Higher Education in Numbers. Retrieved from https://www.universitiesuk.ac.uk/facts-and-stats/Pages/higher-education-data.aspx

Universities UK and CBI. (2009). Future Fit: Preparing Graduates for the World of Work. Retrieved from https://www.universitiesuk.ac.uk/policy-and-analysis/reports/Pages/future-fit-preparing-graduates-for-the-world-of-work.aspx

University of Essex. (2020). Business Management Course Structure. Retrieved from https://www1.essex.ac.uk/programmespecs/Details.aspx?prog=10849

University of Lincoln. (2020). Ba (Hons) Business and Management. Retrieved from https://courses.aber.ac.uk/undergraduate/business-management-degree/

University of South Wales. (2020). Ba (Hons) Business and Management. Retrieved from https://www.southwales.ac.uk/courses/ba-hons-business-management/

Valacich, J. S. (2016). *Information Systems Today : Managing in the Digital World* (Seventh edition / Joe Valacich, University of Arizona, Christoph Schneider, City University of Hong Kong.. ed.): Pearson Education Limited.

van Meter, H. J. (2020). Revising the Dikw Pyramid and the Real Relationship between Data, Information, Knowledge, and Wisdom. *Law, Technology and Humans, 2*(2), 69-80. doi:10.5204/lthj.1470

VanScoy, A., & Evenstad, S. B. (2015). Interpretative Phenomenological Analysis for Lis Research. *Journal of documentation, 71*(2), 338-357. doi:10.1108/JD-09-2013-0118

Vincent, D. R. (1990 p2). Information Technology - Should You Curtail Your Investment? *Financial executive (1987), 6*(3), 50.

Wallace, S. (2015, p43). Robbins Report (1963). In (2 ed.): Oxford University Press.

Wang, Q., Myers, M. D., & Sundaram, D. (2013). Digital Natives and Digital Immigrants: Towards a Model of Digital Fluency. *Business & information systems engineering, 5*(6), 409-419. doi:10.1007/s12599-013-0296-y

Waring, T., & Wainwright, D. (2008). Issues and Challenges in the Use of Template Analysis: Two Comparative Case Studies from the Field. *The Electronic Journal of Business Research Methods, 6*.

Wilkinson, L. C., & Wilkinson, M. D. (2020). Value for Money and the Commodification of Higher Education: Front-Line Narratives. *Teaching in higher education*, 1-17. doi:10.1080/13562517.2020.1819226

Williams, S. (2016). *Business Intelligence Strategy and Big Data Analytics : A General Management Perspective* (1st edition. ed.): Amsterdam, Netherlands : Morgan Kaufmann.

Wilton, N. (2011). Do Employability Skills Really Matter in the Uk Graduate Labour Market?: The Case of Business and Management Graduates. *Work, employment and society, 25*(1), 85-100. doi:10.1177/0950017010389244

Wilton, N. (2012). The Impact of Work Placements on Skills Development and Career Outcomes for Business and Management Graduates. *Studies in Higher Education, 37*(5), 603-620. doi:10.1080/03075079.2010.532548

Woodall, T., Hiller, A., & Resnick, S. (2014). Making Sense of Higher Education: Students as Consumers and the Value of the University Experience. *Studies in higher education (Dorchester-on-Thames), 39*(1), 48-67. doi:10.1080/03075079.2011.648373

Yorke, M. (2004). *Embedding Employability into the Curriculum*. York: York : Learning and Teaching Support Network.

Zelm, M. (2018). *Enterprise Interoperability : Smart Services and Business Impact of Enterprise Interoperability* (1st edition. ed.): London, UK : ISTE Hoboken, NJ : Wiley.

Zorana, E. (2015). Data-Driven Society Begins with Data-Savvy Youth. *Bulletin of the American Society for Information Science and Technology (Online), 42*(1), 42.

Appendices

Appendix 1 Data Literacy module content

University	Guardian League Table Position 2019	Guardian League Table Position 2020	Degree Name	Degree Level	Modules with Perceived Data Literacy Content	Teaching and Assessment Methods
Essex University	81	105	BSc (Hons) Business Management	4	**Quantitative Methods and Finance** Half of a whole year module. "The aim of the first half of this module is to provide an introduction to the subject of quantitative methods and their applications in finance, accounting and management. The module is designed to provide a sound foundation for your future studies. The topics covered include maths revision, the time value of money, rates	2-Hour Weekly Lecture 1-Hour Weekly Problem-Solving Class Extensive Online Support Available Assessed by weekly tests

					of change (calculus), statistics, probability distributions and simple regression”	(52%) and an essay (48%)
				5	**Research Methods in Management and Marketing** Single Semester module Although this is a Research Methods module, it does have some components which may relate to data literacy: “Students completing this module should be able to demonstrate a good understanding of the main quantitative and qualitative methods used in management and marketing research, and an appreciation of the practical application of these methods in a variety of research settings”.	1-hour weekly lecture and 1-hour weekly class (format of class not stated) Assessed by coursework (40%) and 2-hour exam (60%)
				6	No data-literacy specific modules are apparent at Level 6	

University	Guardian League Table Position 2019	Guardian League Table Position 2020	Degree Name	Degree Level	Modules with Perceived Data Literacy Content	Teaching and Assessment Methods
Birmingham City University	83	88	BA (Hons) Business (optional sandwich year)	4	**Essential Analysis for Business** Single Semester Module "This module introduces a range of methods and techniques for calculating and analysing data applicable to business. Where possible the calculations are based on real world data and will include some large and complex data sets.	No methods specific to this module. For the whole degree: **Teaching** "A variety of delivery approaches will be utilised throughout the course, including lectures, seminars, tutorials, workshops, peer teaching and learning, project-based learning, experiments, games and

					Statistical techniques such as correlation, regression and hypothesis testing will be covered so that business useful techniques such as forecasting to be introduced. Data manipulation, such as the production of Pivot Tables, will be covered”	technology-enabled learning”. **Assessment** “A wide variety of assessment methods are used, and throughout the course you will be expected, with the appropriate support, to deliver both individually and in groups, reports, presentations, essays, project plans, exams and proposals”.
				5	No data-literacy specific modules are apparent at Level 5	
				6	**E-Business**	See Level 4

					Single Semester module This module may contain some data literacy content, given that modern techniques to push business products should incorporate some data management and analysis content. “With the business environment undergoing constant changes, organisations can no longer obtain a competitive advantage by simply producing high-quality products. This module will equip you with the	

					knowledge you need to be successful in e-business, using modern techniques to push business products.”	

University	Guardian League Table Position 2019	Guardian League Table Position 2020	Degree Name	Degree Level	Modules with Perceived Data Literacy Content	Teaching and Assessment Methods
Manchester Metropolitan University	86	90	BA (Hons) Business Management	4	**Introduction to Technology and Big Data** Length of module not specified This module is obviously an introduction to Big Data, but presumably also deals with some practical hands-on applications of Big Data analytics. “The rapid growth in digital technologies and the associated	No module-specific information. General information for the whole of Level 4 **Teaching** “Year 1 25% lectures, seminars or similar; 75% independent study” **Assessment** **“**Year 1 90% coursework;

					use in smart devices, sensors and internet applications has resulted in a proliferation of big data, which are defined as data having large volume, high velocity and wide variety. This emergent trend has not gone unnoticed by business and other organisations, which consistently aim to utilise digital technologies to their advantage. As such, they aim to extract value and reap the potential benefits of big data by seeking ways of transforming these high complexity data sets into meaningful business opportunities. The unit will introduce the digital technologies,	10% examination”

					which enable potential value to be captured from big data sets. It will also consider the methods and applications that are used to analyse and translate such data into meaningful, actionable information, which could inform current as well as future business models. Finally, ethical, security and privacy aspects of big data will be considered over the backdrop of some recent high profile and widely publicised case studies, such as Facebook and Google".	
				5	No data-literacy specific modules are apparent at Level 5	

				6	No data-literacy specific modules are apparent at Level 6	

University	Guardian League Table Position 2019	Guardian League Table Position 2020	Degree Name	Degree Level	Modules with Perceived Data Literacy Content	Teaching and Assessment Methods
Anglia Ruskin University	87	82	BSc (Hons) Business Management	4	**Digital Business and Principles of Marketing** Length of module not specified This module appears to be largely focused on marketing, but does recognise the importance of the digital agenda and real-world business issues: “This module presents a fusion between the philosophies which underlie marketing, with a strong emphasis of	Not specified by level or module Generally, for the whole degree: **Teaching** “Your coursework could include problem-solving activities, consultancy projects, presentations and group or individual reports”

					integrating digital and traditional concepts and the real life application of marketing across a variety of sectoral contexts.”	**Assessment** **“**You can expect an interesting mix of coursework, essays, exams and activity-based assignments.”
				5	No data-literacy specific modules are apparent at Level 5	
				6	No data-literacy specific modules are apparent at Level 6	

University	Guardian League Table Position 2019	Guardian League Table Position 2020	Degree Name	Degree Level	Modules with Perceived Data Literacy Content	Teaching and Assessment Methods
Royal Holloway University	67	54	BSc. (Hons) Business and Management	4	**Quantitative Methods** Length of module not specified "In this module you will develop an understanding of quantitative studies and how they are employed in Management and Economics. You will look at how quantitative studies relate to differences, associations and relationships in groups and populations, and	Not specified by level or module Generally, for the whole degree: **Teaching** lectures, groupwork, seminars and workshops, independent learning. **Assessment** "Your course will be assessed by a combination of

					examine a range of statistical techniques.” This implies some degree of the use of data management and analysis tools **Foundations in Digital Enterprise** Length of module not specified **“**In this module you will develop an understanding of information systems and how they have become the backbone of	examinations and in-course assignments in the form of essays or presentations .
				4		

					contemporary businesses. You will consider how they are used by business managers as a tool for achieving operational excellence, developing new products and services, improving decision making, and achieving competitive advantage. You will also examine the broader organisational, human and information technology dimensions of information systems and how they can be used to provide solutions to challenges and problems in the	

					business environment”. This module recognises the importance of information systems in the business world, but appears to be approached from a theoretical rather than practical perspective	
				5	No data-literacy specific modules are apparent at Level 5	
				6	**Business Data Analytics** This is an optional module: Length of module not specified	See Level 4

					“In this module you will develop an understanding of the main managerial and technological principles which underlie business and analytics. You will look at the impact of business data analytics on product and service innovation, and examine the main challenges and risk related to business data analytics activities within organisations. You will learn how to carry out a variety of business data analytics techniques, and consider the impact of legislation, regulation and ethical codes of practice on business data analytics programmes and the	

					organisations running them.” It would appear that there is a certain amount of data literacy content in this module, specifically associated with “business data analytics techniques” but also a large amount of theory.	

University	Guardian League Table Position 2019	Guardian League Table Position 2020	Degree Name	Degree Level	Modules with Perceived Data Literacy Content	Teaching and Assessment Methods
University of South Wales	94	56	BA (Hons) Business and Management	4	No data-literacy specific modules are apparent at Level 4	
				5	**Business Analytics for Decision Making** Single Semester module **“**The ability to make informed decisions is crucial for the success of any business. Through the analysis of financial and statistical data and information, students will be guided through the interpretation of	**Teaching** No information provided. **Assessment** Degree-wide rather than module-specific: “A range of assessment tools are utilised to prepare students for the external world of

					figures to make sense of data and inform decision making. “	employment including business reports, the planning and management of simulated situations, consultancy projects etc.”
				6	No data-literacy specific modules are apparent at Level 6	

University	Guardian League Table Position 2019	Guardian League Table Position 2020	Degree Name	Degree Level	Modules with Perceived Data Literacy Content	Teaching and Assessment Methods
Aberystwyth University	16	59	BSc. (Hons) Business and Management	4	**Data Analysis** Single semester module **“**This module introduces a number of quantitative techniques, and develops the use of statistical analysis at an introductory level. The importance of quantitative methods in informing analysis and good decision making for the effective running of organizations cannot be overestimated. The module provides	**Teaching** Not specified **Assessment** 2-hour exam (60%) 2,000-word Case Study report (40%)

					the opportunity to build and improve numerical, mathematical and statistical skills, and apply these to practical problems in the context of finance, economics and business.”	
				5	No data-literacy specific modules are apparent at Level 5	
				6	No data-literacy specific modules are apparent at Level 6	

University	Guardian League Table Position 2019	Guardian League Table Position 2020	Degree Name	Degree Level	Modules with Perceived Data Literacy Content	Teaching and Assessment Methods
University of Lincoln	47	60	BA (Hons) Business and Management	4	**Analysis of Business Data** Module length not specified **“**This module aims to introduce some quantitative techniques fundamental to the analysis of business data. It seeks to promote a critical awareness and understanding of some of the processes, techniques and technology by which	**Teaching** Not specified **Assessment** Degree-wide rather than module-specific: “coursework such as assignments, project, essay, report, portfolio, and reflective log; practical work including presentation, exhibition, role

					numerical information can be collected and communicated. Students have the opportunity to practice the systematic use of appropriate industry-standard computer technology for the acquisition, analysis and presentation of data (for example, Excel or SPSS)”	play, and oral assessment. Exams can include in-class tests or written exam”
				5	No data-literacy specific modules are apparent at Level 5	
				6	No data-literacy specific modules are apparent at Level 6	

Appendix 2 Evaluation of Modules

	Teaching needs to be current and Business relevant	**Different teaching methods need to be explored, which build upon this currency and relevance**	**Students need to be engaged with the subject and to understand its importance**	**Students need to be taught skills which they can build on in the workplace as changes in technology and business practice occur**
Essex University	For the Level 4 module there is little evidence of this. The module is more concerned with building skills for future studies rather than aligned with current Business skills. This is understandable, given that it is a Level 4 module. The Level 5 module does appear to contain an element of practical application of methods (although concerned with statistics rather than data) but the focus of this module is research rather than business	Very little evidence of innovative teaching methods. A 2 hour lecture as the main method of engagement at Level 4 does not demonstrate an innovative approach. There is little detail of the teaching approach of the Level 5 module.	The subjects identified as being covered on the Level 4 module are presented as a list of (fairly complex) skills which are not likely to engage students if they are approached in this linear manner. The difficulty of the subject is actually addressed in the Module information on the website, with the following notice: "IMPORTANT: Some students find the maths and statistics to be challenging. This is normal. If you find the lectures to be difficult and perhaps moving too quickly,	Little evidence of a lifelong learning approach to the skills taught on these modules. It appears that skills are taught as discrete "topics" which do not lend themselves to further exploration or form the foundations of skills which will be developed in the business workplace.

	Teaching needs to be current and Business relevant	Different teaching methods need to be explored, which build upon this currency and relevance	Students need to be engaged with the subject and to understand its importance	Students need to be taught skills which they can build on in the workplace as changes in technology and business practice occur
			be sure to make use of the additional support available. It appears that this support is online, which might not be the most engaging way for students to obtain support with challenging subject matter. The Level 5 module appears to be more engaging, but as stated previously it is a Research Methods module, focused on academia rather than business.	

	Teaching needs to be current and Business relevant	**Different teaching methods need to be explored, which build upon this currency and relevance**	**Students need to be engaged with the subject and to understand its importance**	**Students need to be taught skills which they can build on in the workplace as changes in technology and business practice occur**
Birmingham City University	The Level 4 module appears to address the subject of business data and is related to current business needs, with the use of real-world data and large and complex data sets as examples. The Level 6 E-business module does not appear to be a data literacy skills module at all, but it is useful in the fact that it addresses the issues associated with the fast-changing business world in the context of e-business	No specific teaching methods are discussed in the context of these modules. In terms of the degree overall, a wide variety of methods (both teaching and assessment) appear to be used.	The use of real-world data and the discussion of business techniques (both data analysis and e-business) is likely to be engaging to students. The content of both modules appears to stress the importance of the subject.	An understanding of large and complex data sets plus an awareness of the importance of e-business are a very good starting point for graduates to enter the workplace and start to build data literacy skills relevant to their particular employer.

	Teaching needs to be current and Business relevant	**Different teaching methods need to be explored, which build upon this currency and relevance**	**Students need to be engaged with the subject and to understand its importance**	**Students need to be taught skills which they can build on in the workplace as changes in technology and business practice occur**
Manchester Metropolitan University	The Level 4 module appears to be extremely business relevant, tackling the subject of Big Data and exploring new digital technologies. The module description mentions large, complex data sets and the consideration of the methods and applications used to analyse data and transform it into meaningful information. It is not clear how much hands-on manipulation of data is included in this module and therefore how theoretical the module is, rather than practical	No specific teaching methods are discussed in the context of this module. In terms of the whole degree. Only lectures, seminars and independent study are identified as teaching methods.	This is an engaging subject which is likely to appeal to students. The importance of modern and changing tools and technologies are stressed.	No real mention of skills gained from this module. Identification of the fact that digital and data analysis tools used now and introduced on this module are useful in both current and future business modelling.

	Teaching needs to be current and Business relevant	**Different teaching methods need to be explored, which build upon this currency and relevance**	**Students need to be engaged with the subject and to understand its importance**	**Students need to be taught skills which they can build on in the workplace as changes in technology and business practice occur**
Anglia Ruskin University	There is no real data literacy focused module offered on the Business Management degree here. The Level 4 module identified in the previous table is more concerned with marketing, rather than data literacy skills, but it does introduce the digital agenda and addresses real-world business issues.	No specific teaching methods are discussed in the context of this module. In terms of the whole degree a range of coursework activities are identified including problem-solving activities, consultancy projects, presentations and group or individual reports. This format is continued into a similar set of assessment tasks. This demonstrates a use of different teaching methods, but does not really address the issue of data literacy.	This module covers an interesting and engaging subject. The module addresses the digital agenda, but in a theoretical rather than practical skills-based way.	This is not really a skills-based module.

	Teaching needs to be current and Business relevant	Different teaching methods need to be explored, which build upon this currency and relevance	Students need to be engaged with the subject and to understand its importance	Students need to be taught skills which they can build on in the workplace as changes in technology and business practice occur
Royal Holloway University	The Level 4 "Quantitative methods" module appears to be a standard quantitative/business statistics course. No mention is made of real-world business examples or connection with the current business world. The other Level 4 module, "Foundations in Digital Enterprise" appears to explore some aspects of Information Systems theory. This seems to take a theoretical approach which does address current business issues and the application of Information Systems solutions. The Level 6 Business Data analytics module appears to	No specific teaching methods are discussed in the context of these modules. In terms of the whole degree teaching methods are listed as "lectures, groupwork, seminars and workshops, independent learning" with no mention of innovative teaching methods.	The Quantitative methods module is described with a list of different methods of quantitative studies as they relate to Management and Economics plus the examination of a range of statistical techniques. This type of language does not appear to be particularly engaging to students. There is little consideration of the importance of the subject in the wider business context. The Digital Enterprise module appears to be more engaging and considers the importance of Information systems to contemporary business. However, this module does not appear to include any hands-on skills content.	The Quantitative methods module appears to be a skills-based module, but it does not include any focus on the changing landscape of business technology. The Digital enterprise module considers this issue but from a theoretical rather than a skills-based perspective. The Business Data Analytics module appears to address the issues around changing workplace technology and is certainly likely to help students develop a mindset which recognises this changing landscape and help them to cultivate a

	really address the issue of data analytics in the business world, recognising the importance and relevance of the subject. It also appears to offer some sills-based content regarding data analytics techniques. The module also appears to contain a large amount of theory and is an optional rather than core module.		The Level 6 Business Data Analytics module appears to cover an engaging range of content which recognises the importance of the subject in the business world. As it is an optional module, students who select it are likely to be interested and engaged in the subject.	lifelong learning approach to this area.

	Teaching needs to be current and Business relevant	**Different teaching methods need to be explored, which build upon this currency and relevance**	**Students need to be engaged with the subject and to understand its importance**	**Students need to be taught skills which they can build on in the workplace as changes in technology and business practice occur**
University of South Wales	The Level 5 module appears to be a standard quantitative/business statistics module. No mention is made of real-world business examples or connection with the current business world. There is however, a focus on the use of figures and statistics to inform business decision-making which directs students towards the relationship between business data and business decisions.	No teaching methods provided.	This module appears to be a standard business statistics module. However, the emphasis on decision-making and how this is supported by the analysis of data can be engaging if approached in an appropriate manner, using real-life business data and scenarios.	This module appears to be skills-based but does not appear to promote a lifelong learning mindset in relation to these skills. The focus on decision-making does focus on the relationship between data analysis and business decisions, which is a useful thing to understand, as technology and business continue to develop.

	Teaching needs to be current and Business relevant	**Different teaching methods need to be explored, which build upon this currency and relevance**	**Students need to be engaged with the subject and to understand its importance**	**Students need to be taught skills which they can build on in the workplace as changes in technology and business practice occur**
Aberystwyth University	The Level 4 module is a quantitative/business statistics module. No mention is made of the use of real-world business data, but the importance of decision-making, based on analysis is very much stressed.	No teaching methods provided.	It is possible that the emphasis on building and improving numerical, mathematical and statistical skills fails to engage students. An emphasis on practical problems in business may serve to counter this, although it would be useful to know if real and “interesting” business data is used in the teaching of the module. There importance of the subject to business appears to be greatly stressed by this module.	From a skills perspective, this module does not appear to build a lifelong learning mindset. However, the focus on decision-making does focus on the relationship between data analysis and business decisions, which is a useful thing to understand, as technology and business continue to develop.

	Teaching needs to be current and Business relevant	**Different teaching methods need to be explored, which build upon this currency and relevance**	**Students need to be engaged with the subject and to understand its importance**	**Students need to be taught skills which they can build on in the workplace as changes in technology and business practice occur**
University of Lincoln	The Level 4 module is a quantitative/business statistics module. There is no evidence of use of real-world business data. However, the focus on critical awareness and understanding of techniques and technology demonstrates an alignment with business concerns.	No teaching methods provided	A focus on numerical and statistical information can fail to engage students. Excel and SPSS are the tools used on this module and students may find the use of these tools difficult if they ae not presented in and engaging and accessible format.	From a skills perspective, this module does not appear to build a lifelong learning mindset. However, if it allows for the development of a good understanding of processes, techniques and technology then this can allow for the development of new skills once students enter the workplace and start to build skills relevant to their particular employer.

Appendix 3 Module Descriptor for Level 3 module

Northumbria University Programme Framework for Northumbria Awards - Module Specification

Faculty	Business and Law	**Department**		Marketing, Operations and Systems (MOS)	**Subject**	Analytics	**Module Tutor**		Philip Oliver	
Module Title	Business Analysis for Decision Making						**Module Code**		BM9403	
Module Type* *(see key below)*	**STAN**									
Module size credits	**Level 3:**		**Level 4:**	20 credits	**Level 5:**		**Level 6:**		**Level 7:**	
Home programme/s for which the module is designed				BA(Hons) Marketing BA(Hons) Business and Marketing BA(Hons) Business Management BA(Hons) Business and Human Resource Management BA(Hons) Tourism and Events Management BA(Hons) Business and Entrepreneurship BA(Hons) Entrepreneurship BA(Hons) International Business Management				**Code/s**	
Additional Programme/s other than that/those for which the module for specifically designed								**Code/s**		

Delivery Pattern (Please tick)	Semester based *(please specify)*	Sem 1 ☒ Sem 2 ☒	Year Long	☐	Full-time Part-time Distance Learning	☒ ☐ ☐
Location(s) of delivery: If delivered at EPWO partners please give partner name and location						

KEY:

APL	*Accreditation for prior learning*	*P/F*	*Pass/fail module*	*PLIN*	*Placement - Industrial*
CORE	*PNVQ core skills module*	*P/F_DS*	*Pass/fail dissertation module*	*PRAC*	*Practical*
DISS	*Dissertation*	*P/F_PJ*	*Pass/fail project module*	*PROJ*	*Project*
FLDW	*Fieldwork*	*P/F_PL*	*Pass/fail placement module*	*STAN*	*Standard module*
INDS	*Independent study*	*PLAY*	*Placement – academic study abroad FT*	*WKBS*	*Work base study*
MAFOUN	*MA foundation modules - ASS*	*PLCL*	*Placement – Clinical*	*WORK*	*Workshop*

Module Overview (Max 250 words per section) (This section is aimed at providing a prospective or current student with a brief overview of the module in answer to the specific questions and will form an element of the module handbook)

What will I learn on this module? (SRS 0001) Please give a brief indication of the content of the module including the main topic / subject areas studied

In this module, you will develop the knowledge and skills in applying a variety of quantitative data analysis techniques to support business decision making. You will be introduced to business modelling using appropriate analytical tools, and your learning will cover a range of techniques to help business forecasting and data presentation.

In this module you will be exposed to a range of data analysis tools and skills, including:

- Business Analysis and Modelling: management of complex and varied data sets; building spreadsheet models.
- Data Trends and Associations e.g. identifying relationships between business variables.
- Business Forecasting and Predictive Modelling – analysing factors and trends for business planning.
- Business and Dashboard reporting – consolidation, interpretation and presentation of data for professional output.
- Data distribution, data presentation and using summary statistics – handling a range of data for statistical analysis.
- Gaining an understanding of the overlap between business and research data and the selection of appropriate tools for management of both types of data.

Working with these analysis tools, you will learn to develop confidence in dealing with a wide range of data sets. You will become familiar with the role of modelling as an aid to problem solving and will build skills which enable you to interpret data and present your findings to a range of audiences. Very importantly, you will gain a good understanding of the crucial role that analysis of data and interpretation of results plays in the decision-making arena.

How will I learn on this module? (SRS 0002) Please provide a brief overview the learning and teaching approaches the student can expect to experience.

The one-hour weekly lectures will provide you with a theoretical underpinning for your learning, supported by two-hour weekly IT workshops which will give you an opportunity to practice the various analytical techniques, allowing you to build up a proficiency in the use of Excel spreadsheets and the necessary skills of interpretation and communication of findings. These workshops will be tailored to your programme of study through the practical examples set being linked to your subject discipline. You will be able to follow up on these lectures and IT workshops through a one-hour weekly webinar with the members of the teaching team and fellow students to reinforce both the practical and theoretical learning.

There will be several additional exercises located on the module's e-learning portal that will permit you to undertake further practice independently. The module has a supporting reading list that provides you with an opportunity to see how the various decision making and analytical techniques are applied to further managerial and research-based problems, as well as reference to a core text that will support your learning with further reading and practical examples.

Your directed study will support the work you have undertaken in the contact sessions. You will be expected to keep up-to-date with your IT workshop exercises. In addition, you will be set a selection of exercises to complete. To aid with self-assessment on progress, solutions to these exercises will be made available to you on the e-learning portal.

Independent learning time is set aside for learning activities, self-identified by you, to gain a deeper and broader knowledge of the subject. You may complete the review exercises, work with the electronic support tools (such as recordings of IT applications), attempt to complete past examination papers or undertake further reading.

How will I be supported academically on this module? (SRS 0003) Please provide a brief overview of the academic support available to students, including any support that may be accessed outside formal scheduled teaching.

Support will be provided to you by a member of academic staff leading the module and providing the lecture input. A team of academic staff are allocated IT workshop groups of about 20 students, which provides closer, more personal academic support. These IT workshop groups are typically based on study programme cohorts, so you will be taught here alongside fellow members

from your specific programme. The final aspect of the direct contact support is a 1-hour weekly webinar, where students can link with the module tutor and other members of the teaching team to engage in question and answer sessions on the module materials and assessment brief.

Your module is supported by an e-learning portal, which hosts lecture materials, IT workshops exercises and data files, alongside assessment details and various support facilities such as recordings of certain lectures and IT applications, alongside other electronic support facilities such as the module reading list.

You will have a wide-ranging electronic reading list that comprises of various textbooks whose contexts will reinforce the lecture and IT workshop inputs, alongside academic reports, conference papers and journal articles that showcase the application of various quantitative techniques presented in the module.

The module assessment consists of several inter-related tasks which will be distributed throughout your teaching semester. This will encourage your active participation in the learning process throughout the semester. The e-learning portal will permanently host these tasks after release to ensure that you can always access the information required. Your work on these tasks will be the pre-work for a 2-hour unrestricted (open notes) examination at the end of the module.

What will I be expected to read on this module? (SRS 0004) All modules at Northumbria include a range of reading materials that students are expected to engage with. The reading list for this module can be found at: http://readinglists.northumbria.ac.uk

See Appendix 1.

(Reading List service online guide for academic staff, this contains contact details for the Reading List team – http://library.northumbria.ac.uk/readinglists)

Northumbria University Library Reading List Service (please confirm the following)	**Please give date added**
A draft reading list has been created and on the university Library Reading List Service	Click here to enter a date.
Reading material has been acquired and digitised (following approval)	Click here to enter a date.
Reading list has been published to students (for module delivery)	Click here to enter a date.

NB – for PFNA alignment process only, module authors should complete either the University Library e-Reading List, or Appendix 1.

Module Learning Outcomes (MLOs) *(Max of five in total*, for standard 20-credit modules)*

**this can increase to a maximum of 10, for modules with more than 20 credits*

What will I be expected to achieve? (SRS 0005) **Knowledge & Understanding:** • Understand a variety of introductory statistical techniques and their application to the analysis and interpretation of business data for a variety of organisational applications. **[MLO1]** • Understand and demonstrate the role of modelling as an aid to decision making; through the selection of models and techniques to assist in the solution of business problems. **[MLO2]** • Develop an understanding of how data analysis can inform business decision making **[MLO3]**	**How will I be assessed?** (SRS 0006) *Please give details of all formative and summative assessment process indicating which MLOs will be addressed and how feedback will be provided*. Formative assessment will be provided on an ongoing basis throughout the module, where feedback will be provided during the practical IT workshop classes relating to the activities being undertaken, with further support being provided by the posting of outline solutions to these exercises on the e-learning portal. Further formative feedback will be supported through posted recordings, particularly in the support of IT applications. The weekly webinar sessions are a further channel for formative feedback on both the theoretical and practical aspects of the module and on the tasks that underpin the summative assessment. The summative module assessment consists of several inter-related tasks which will be distributed throughout your teaching semester. This will encourage your active participation in the learning process throughout the semester, thereby providing ongoing feedback on	**Programme (Level) Learning Outcomes that this module contributes to:** *[Please insert PLO number as listed on the programme specification]* **BA(Hons) Marketing** **Knowledge & Understanding:** • Identify contemporary professional practice in marketing and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of marketing to solve complex problems related to professional practice, thereby identifying justifiable solutions. **[PLO 4.1.2]** **BA(Hons) Business and Marketing** **Knowledge & Understanding:** • Identify contemporary professional practice in business and marketing and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of business and marketing to solve complex problems related to professional

	your understanding of the module content. The eLearning portal will be used to permanently host these tasks after release to ensure that you can always access the information required. Your work on these tasks will provide you with further chance to practice the various areas of data analysis and modelling, as well as forming the pre-work for a 2-hour examination at the end of the module. This examination forms the summative assessment and represents 100% of the module mark. It will be based on a set of short answer questions covering all the pre-work tasks completed and will be in an unrestricted (open notes) format. This will assess **MLO1, MLO2** and **MLO3.**	practice, thereby identifying justifiable solutions. **[PLO 4.1.2]** **BA(Hons) Business Management** **Knowledge & Understanding:** • Identify contemporary professional practice in business and management and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of business and management to solve complex problems related to professional practice, thereby identifying justifiable solutions. **[PLO 4.1.2]** **BA(Hons) Business and Human Resource Management** **Knowledge & Understanding:** • Identify contemporary professional practice in business and HRM and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of business and HRM to solve complex problems related to professional practice, thereby identifying justifiable solutions. **[PLO 4.1.2]**

		BA(Hons) Tourism and Events Management **Knowledge & Understanding:** • Identify contemporary professional practice in tourism and events and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of tourism and events to solve complex problems related to professional practice, thereby identifying justifiable solutions. **[PLO 4.1.2]** **BA(Hons) Business and Entrepreneurship** **Knowledge & Understanding:** • Identify contemporary professional practice in entrepreneurship and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of entrepreneurship to solve complex problems related to professional practice, thereby identifying justifiable solutions. **[PLO 4.1.2]** **BA(Hons) Entrepreneurship** **Knowledge & Understanding:**

		• Identify contemporary professional practice in entrepreneurship and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of entrepreneurship to solve complex problems related to professional practice, thereby identifying justifiable solutions. **[PLO 4.1.2]** **BA(Hons) International Business Management** **Knowledge & Understanding:** • Identify contemporary professional practice in international business and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of international business to solve complex problems related to professional practice, thereby identifying justifiable solutions. **[PLO 4.1.2]**

Pre-requisite(s) (SRS 0007) Any module which must already have been taken, or any stipulated level of prior knowledge required in order to study this module, (co-requisite core models need not be listed	None
Co-requisite(s) (SRS 0008) Modules at this level which must be taken with this module	None

Module abstract (SRS 0009)

Please provide a brief a brief abstract of the module (150 words max). This section acts as the 'shop window' for the module, therefore it needs to engage and inspire the student. This is the first thing that the student will read about this module, so it must immediately grab their attention. The main aim is to encourage the student to read on, however the summary should be written in such a way that if the student reads nothing else this section will convey all key messages and benefits that the module will offer. Start by explaining the module title where necessary. Then highlight any selling points relating to the four pillars: Research-Rich Learning; Technology Enhanced Learning; Assessment and Feedback; Employability and Entrepreneurship. Examples may include student satisfaction rates, learning environment, state-of-the-art facilities etc. Finally indicate benefits of the module such as the key skills that the students will gain for future employment and career paths that are open to them.
The module will equip you with skills to help you when dealing with analytical content in future study and employment, either work placement or graduate role, with an appropriate level of understanding and proficiency in some commonly used analytical business applications. The module will provide you with a theoretical understanding of various business modelling and data handling applications supported through practical tutor-led workshops. You will be assessed on your understanding and proficiency in data management, analysis and presentation using appropriate tools. The assessment will aim, wherever possible, to simulate "real-world" tasks and scenarios. You will therefore be required to work on a series of tasks over the course of the semester in preparation for the final assessment. The data-handling and interpretative skills learned on this module are directly transferable to your further academic study and working life and are vital in a wide range of graduate roles. The skills and tools identified for use in the module are based upon research and collaboration with a variety of businesses. In line with this, and to deepen your understanding of the practical content of the module, you will also be expected to engage in additional reading to aid your understanding of the importance of the use of data modelling, analysis and interpretation in both business and academic settings, thereby engaging in research-led learning.

Programme Framework for Northumbria Awards Research Rich Learning Design Pillar (SRS 0090)

Embedding Research Rich Learning into the curriculum: Indicate how students will be actively engaged in research rich learning in this module through: research/enquiry based learning, research tutored learning, research led learning and/or research oriented learning, providing a brief overview of how this / these will feature within the delivery of the module (250 words max)

Note:

- **Research/enquiry Based:** L&T Based on student-centred enquiry and research activities (conducting research).
- **Research Tutored**: L&T Emphasises learning focused on students actively discussing research, and critically engaging with research outputs
- **Research Led**: T&L structured around subject content and that content is based on the research (learning about research)
- **Research Orientated:** T&L Emphasises understanding of the knowledge production process, and methods of enquiry in the subject (learning how to research)

The research built into this module is predominantly research led, where you will learn about research through wider subject reading related to the managerial and research applications of the various analytical and decision making techniques presented within the module.

There is a reading list covering each of the topics presented in the module. This reading list will comprise textbooks and research publications.

The textbooks will provide further reading about the tools and techniques presented in the module's lectures and IT workshops and how the associated analysis can be executed using accessible business software such as Excel, with business applications central to this additional reading. In learning about these applications and their analysis, interpretation and business relevance, you will experience research-oriented learning.

The journal articles and reports that comprise the research publications in the reading list cover various managerial and research applications, thereby showcasing to you the wide level of application and relevance of the subject to the broad business and management discipline. This additional reading, based on research, will help you develop an understanding into how research is conducted and how the content of this module supports this work and the associated researchers in terms of tools and techniques for data analysis and modelling. Your additional reading further supports your knowledge generation across the subject discipline and provides you with experience of research-led learning.

Notional Student Workload (NSW) for each mode of delivery

Complete for each delivery mode where the distribution of NSW **Full Time Mode of Delivery**				**Part Time Mode of Delivery**			
Activity type	**Hours**	KIS category	KIS category hours		**Hours**	KIS category	KIS category hours
Lecture	12	Scheduled	48	Lecture		Scheduled	
Webinar	12			Seminar			
Tutorial				Tutorial			
Project Supervision				Project Supervision			
Demonstration				Demonstration			
Practical classes and workshops	24			Practical classes and workshops			
Supervised time in studio/ workshop				Supervised time in studio/ workshop			
Fieldwork				Fieldwork			
External visits				External visits			
Tutor guided independent learning	48	Independent	152	Tutor guided independent learning		Independent	
Student independent learning	104			Student independent learning			
Placement		Placement	0	Placement		Placement	
Study abroad				Study abroad			
Work based learning				Work based learning			
Total workload *200 hours for 20 credit module*	*200*		*200*	**Total workload**			

Summative Assessment

Sequence *001, 002 etc.*	**Activity type** *indicate **ONE** of the following types:*	**Brief description of assessment (max.120 characters)** *e.g. type/ length of exam, type/ word limit of coursework*	**Weighting** % or Pass/Fail (for grade only components) *Note: % weightings should add up to 100% for module overall*	**Final assessment**		**Anonymous submission**		**ESAF submission**	
				Yes	*No*	*Yes*	*No*	*Yes*	*No*
001	EXAM (Written examination)	This is a 2-hour, unrestricted examination using pre-work based on various Excel-based analytical tasks	100%	☒	☐	☒	☐	☐	☒
002	Choose an item.			☐	☐	☐	☐	☐	☐
003	Choose an item.			☐	☐	☐	☐	☐	☐
004	Choose an item.			☐	☐	☐	☐	☐	☐
005	Choose an item.			☐	☐	☐	☐	☐	☐
006	Choose an item.			☐	☐	☐	☐	☐	☐
007	Choose an item.			☐	☐	☐	☐	☐	☐
008	Choose an item.			☐	☐	☐	☐	☐	☐
009	Choose an item.			☐	☐	☐	☐	☐	☐
010	Choose an item.			☐	☐	☐	☐	☐	☐
011	Choose an item.			☐	☐	☐	☐	☐	☐
012	Choose an item.			☐	☐	☐	☐	☐	☐

Reassessment (specify either synoptic or non-synoptic)

Synoptic reassessment *One form of reassessment that tests all module learning outcomes*	Yes	☐	No	☒
Non-synoptic reassessment *Where module referred overall, individual failed components of assessment are reassessed*	Yes	☒	No	☐

Appendix 1

Indicative Reading for PFNA alignment approval only *(to be completed only if e-reading list unavailable at point of alignment approval)*

N.B. This outline indicative reading list will be utilised for approval purposes only, and **a full e-reading list must be produced and available by the June of the academic year prior to the first delivery date of the module** (at which point the section of p.2 referring to University Library Reading Lists should be completed).

Please list below essential key text underpinning the module content and ultimately the learning outcomes:

Core Text

Morris, C. (2012) Quantitative Approaches in Business Studies, 8th edition, FT Prentice Hall

Supplementary Texts

Davis, G & Branko, P (2010), Business Statistics using Excel, Pearson

Guffy, ME & Loewy, D (2012), Essentials of Business Communication (9th Edition), South Western (Cengage Learning)

Rowntree, D (2004), Statistics without Tears, Financial Times, Prentice Hall

Smailes, J & McGrane, A (2000), Essential Business Statistics, Pearson Education

Triola, M (2007), Elementary Statistics using Excel, Pearson

Waters, D (2008), Quantitative Methods for Business, Oxford University Press

Whigham, D (2007), Business Data Analysis using Excel, Oxford University Press

Winston, Wayne, L. (2019), Microsoft Excel 2019: Data Analysis and Business Modelling, Pearson Education

Wisniewski, M. (2009), Quantitative methods for Decision Makers (5th Edition), FT Prentice Hall

Research Reports

Robson, A. and Hart, D.J. (2019). Charitable Donations: Home and Away. Research Report Produced in Partnership with the Marketing Trust. ISBN: 978-1-5272-4410-8. Published 2019.

Hart, D.J. and Robson, A. (2017). *Charity Begins at Home: Understanding the role of national identity on propensity to donate to local, national and international charities*. Research Report Produced in Partnership with the Marketing Trust. ISBN: 978-1-5272-0978-7. This report is published as an e-book by David Hart Publishing.

Journal Papers

Brown, D. M., Robson, A., and Charity, I. (2018). International Masters' student perspectives of team business simulations. The International Journal of Management Education.

Sainidis, E., Robson, A., and Heron, G. (2019). Environmental turbulence and the role of business functions in the manufacturing strategy debate: The case of UK-based SMEs and the Great Recession. Journal of General Management, 44(4), 190-208.

Websites and Blogs

The datapine Blog, available at https://www.datapine.com/blog/

Lebied, Mona (2018), *A Guide To The Methods, Benefits & Problems of The Interpretation of Data*, available at [last accessed May 2020]:
https://www.datapine.com/blog/data-interpretation-methods-benefits-problems/

Bradford L. (2018), *Why All Employees Need Data Skills In 2019 (And Beyond),* available at [last accessed May 2020]:
https://www.forbes.com/sites/laurencebradford/2018/10/11/why-all-employees-need-data-skills-in-2019-and-beyond/#38a67473510f

Appendix 4 Email to employers

Dear «Contact»

My name is Liz Cunningham and I am a Senior Lecturer in Business and Management at Northumbria University Business School. I am contacting you because your name appears on the Business School contact list. The reason for this is that your organisation has offered Work Placements or other activities for students in the past and you are the named individual on the list. If you are not the right person to contact, or you would like to be taken off the list, please let me know.

The reason that I am contacting you is concerned with some research I am carrying out for my DBA qualification. I am interested in the data management skills of our Business and Management graduates and investigating the alignment between the skills we teach our students in this area and the requirements of Business, specifically in the North East of England.

In order to complete this project, I need to speak to a range of local employers in order to understand something of their experience and opinions on this topic. To this end, I am asking if you would be willing for me to interview you at some time over the next three months (August to October this year). An interview would take approximately 45 minutes of your time. All interviews will be completely anonymous and I will not be asking for any personal information. Data collected from the interviews would only be used for this project and would be destroyed once my DBA thesis is complete.

I would really appreciate the opportunity to hear your views on this topic, as I feel that this research could be of real benefit to both our graduates and to local organisations. If you would like any more information, I am very happy for you to contact me. Also, if you feel you are not the right person to take part in this, I am happy for you to pass the details on to anyone else in your organisation.

Thank you very much.

Liz Cunningham

Liz Cunningham MScBIT BA (Hons)
Senior Lecturer in Information Management
Programme Leader (Business with Management)
Newcastle Business School
Northumbria University
City Campus East 1
Newcastle Upon Tyne
NE1 8ST
Tel: 0191 227 3327

Appendix 5 Email to Level 6 students

Dear <<contact>>

Welcome back to your Final year of Business with Management! This will probably be the only contact you have with me this Semester as I am on Sabbatical during Semester 1.

The reason that I am contacting you is concerned with some research I am carrying out for my DBA qualification. I am interested in the spreadsheet and database skills of our Business and Management graduates and investigating the alignment between the skills we teach our students in this area and the requirements of Business, specifically in the North East of England.

In order to complete this project, I need to speak to a range of students in order to find out their experience and opinions on this topic. I am particularly interested in speaking to Final Year students. To this end, I am asking if you would be willing for me to interview you at some time over the next two months (November and December this year). An interview would take approximately 45 minutes of your time. All interviews will be completely anonymous and I will not be asking for any personal information. Data collected from the interviews would only be used for this project and would be destroyed once my DBA thesis is complete.

I would really appreciate the opportunity to hear your views on this topic, as I feel that this research could be of real benefit to both our graduates and to local organisations.

AS AN ADDED INCENTIVE, EVERYONE WHO AGREES TO BE INTERVIEWED WILL RECEIVE A £10 AMAZON VOUCHER!

If you would like to participate, please reply to this email. You may receive an "out of office" reply (as previously mentioned, I am currently on sabbatical) but I will be reading responses to this email. If you could let me know, in your reply:

- Any days/dates which would not be suitable for you or any that you would prefer.

Thank you very much and I look forward to hearing from you.

Liz

Liz Cunningham MScBIT BA (Hons)
Senior Lecturer in Information Management
Programme Leader (Business with Management)
Newcastle Business School
Northumbria University
City Campus East 1
Newcastle Upon Tyne
NE1 8ST
Tel: 0191 227 3327

Appendix 6 Email to Level 4 students

Dear <<contact>>

Once again, thank you very much for offering to take part in an interview for my DBA research. As I said originally, each interview will take about 30 minutes and you will receive a £10 Amazon voucher as a thank you for taking part. I will be asking questions about your opinions on the BM9400 module. I am not interested in your personal performance, so don't worry about that at all!

I have decided to conduct interviews on Wednesday afternoons in February and March: the dates will therefore be:

5th, 12th, 19th and 26th February and
4th, 11th, 18th and 25th March

I would be very happy if you could email me and let me know which of these days would be suitable for you and if you have a preference for a particular time. If Wednesday afternoons are no good for you, please let me know an alternative day and I will do my best to accommodate you.

Thanks again – I am really grateful to you for agreeing to do this.

I look forward to hearing from you.

Liz

Liz Cunningham MScBIT BA (Hons)
Senior Lecturer in Information Management
Programme Leader (Business with Management)
Newcastle Business School
Northumbria University
City Campus East 1
Newcastle Upon Tyne
NE1 8ST
Tel: 0191 227 3327

Appendix 7 Ethics Approval

Research Ethics: Your submission has been approved

E **EthicsOnline@Northumbria <EthicsOnline@Northumbria>**
22/06/2018 10:45

To: Liz Cunningham

Dear Liz Cunningham,

Submission Ref: 9679

Following independent peer review of the above proposal*, I am pleased to inform you that **APPROVAL** has been granted on the basis of this proposal and subject to continued compliance with the University policies on ethics, informed consent, and any other policies applicable to your individual research. You should also have current Disclosure & Barring Service (DBS) clearance if your research involves working with children and/or vulnerable adults.

* note: Staff Low Risk applications are auto-approved without independent peer review.

The University's Policies and Procedures are here

All researchers must also notify this office of the following:

- Any significant changes to the study design, by submitting an 'Ethics Amendment Form'
- Any incidents which have an adverse effect on participants, researchers or study outcomes, by submitting an 'Ethical incident Form'
- Any suspension or abandonment of the study.

Please check your approved proposal for any Approval Conditions upon which approval has been made.

Use this link to view the submission: View Submission

Research Ethics Home: Research Ethics Home

Please do not reply to this email. This is an unmonitored mailbox. If you are a student, queries should be discussed with your Module Tutor/Supervisor. If you are a member of staff please consult your Department Ethics Lead.

Appendix 8 Faculty Informed Consent Form

Faculty of Business and Law

Informed Consent Form for research participants

Title of Study:	Data Literacy skills of graduates and the effect of such skills on employability
Person(s) conducting the research:	Liz Cunningham
Programme of study:	DBA
Address of the researcher for correspondence:	Room 248 Newcastle Business School CCE01
Telephone:	07779246919
E-mail:	liz.cunningham@northumbria.ac.uk
Description of the broad nature of the research:	See separate sheet
Description of the involvement expected of participants including the broad nature of questions to be answered or events to be observed or activities to be undertaken, and the expected time commitment:	Participation in semi-structured interview which will be recorded and transcribed simultaneously. The interview will take around 45 minutes. No personal data will be recorded, so participants will be completely anonymous.

Description of how the data you provide will be securely stored and/or destroyed upon completion of the project.	Transcriptions will be stored securely on a password protected area of the University network. Voice data will be deleted immediately after the interview. Transcriptions will be deleted once the data analysis phase of the study is complete.

Information obtained in this study, including this consent form, will be kept strictly confidential (i.e. will not be passed to others) and anonymous (i.e. individuals and organisations will not be identified *unless this is expressly excluded in the details given above*).

Data obtained through this research may be reproduced and published in a variety of forms and for a variety of audiences related to the broad nature of the research detailed above. It will not be used for purposes other than those outlined above without your permission.

Participation is entirely voluntary and participants may withdraw at any time.

By signing this consent form, you are indicating that you fully understand the above information and agree to participate in this study on the basis of the above information.

Participant's signature: Date:

Student's signature: Date:

Please keep one copy of this form for your own records

Appendix 9 Employer Interview Questions

Question	Rationale	Link to Literature and Themes
1. Can you give me a brief description of your company?	These are just classification questions – it is not necessary to link them to specific themes.	
2. Approximately how many people does the company employ?		
3. What is your role/job title?		
4. Do you have specific responsibilities regarding the employment and management of graduates?		

The next section of the interview will concentrate on graduates and Employability, in line with Themes 3 and 4. It might seem like the wrong way round, but I think it will flow better this way.

Question	Rationale	Link to Literature and Themes
5. What are your thoughts about graduates and young people in general in the context of their use of computers and other technological tools?	The literature identifies the fact that the current generation of young people (Generation Z and beyond) have a facility with technological "gadgets" as they have grown up with them. This makes them different to previous generations.	Theme 3 (Prensky, 2001) (Mintel Group, 2018)
6. In your experience, are graduates able to proficiently use data management software such as spreadsheets and databases when they come to work for you.	A large part of the rationale for this thesis is related to the fact that B and M students appear to be much more apprehensive about spreadsheets and databases than they are about more intuitive software, such as social media. I am interested to see if employers notice the same thing. This is linked to the previous question, and serves to question the belief that confidence with "gadgets" and social media also mean confidence with business computing tools.	Themes 3 and 4 (Universities UK 2015) (Duxbury & Ormsbee, 2017)

I will now give them the Universities UK definition of data literacy.

"*Research design, data collection, data management, data analysis, modelling, interpretation and the presentation of research findings*"

and explain that this is the skillset I am interested in talking about, specifically related to Business.

7. Does this definition fit with the skills you feel that your company requires from graduates in this area?		
8. Do you think that graduates are in possession of these skills when they join your company?	Linked to previous question	
9. When you employ new graduates, which of the following two attributes are most important: Data Literacy skills as described above? or Industry interest/experience?	This is adapted from the Data Grammar survey. The other two attributes identified by this report were proficiency in another language and management experience, neither which I felt were relevant in the context of B and M graduates	Themes 2 and 4 (Alteryx, 2016)
10. Do you think data literacy skills should be taught as a compulsory part of B and M degree programmes.	Adapted from Data Grammar survey. Their question referred to MBA programmes.	As above
11. What skills do you think are the most important for graduates when they first join your company?	At this point they may not say data literacy, which I am happy with – I don't want to lead them with this question. Magitti defines data analysis as one of the top three skills required of Business Graduates. The other two are critical thinking and challenging of the status quo – both which I feel can be linked to data literacy, in any case.	Theme 4 (Maggiti, 2015) Various employability frameworks

12. Have you heard of the term "Knowledge Worker?" What do you think is meant by this term?	This term has been around for a while and I think it is a useful popular description of the kind of worker many of our graduates become. I put this question in, as I thought interviewees would feel comfortable attempting a definition.	Theme 2 (Castells, 2010) (Mutch, 2008) (Richards & Gottlob, 2017)
13. Do you think that people in your organisation are "Knowledge Workers"?	My pilot interviewee made the observation that "we are all knowledge workers now". She was not just talking about the public library service, but about work in general. I thought this was a really interesting observation and it led to a productive discussion, so I thought it would be a useful concluding question. I am specifically choosing not to ask them if everyone in their organisation is a Knowledge Worker, or just some people – I would like them to clarify this themselves as I think this will help me to gain an understanding of how their organisation works, in this context and how graduates might fit in.	Theme 2

Appendix 10 - Student Interview Questions (L4 and L6)

Question	Rationale	Link to Literature and Themes
1. Can you tell me a bit about your Programme?	These are just classification questions – it is not necessary to link them to specific themes.	
2. What made you choose this Programme?		
3. Did you plan to do a Placement?		

The next section of the interview will concentrate on graduates and Employability, in line with Themes 3 and 4 and fitting in with the questions asked of Employers.

Question	Rationale	Link to Literature and Themes
4. What are your thoughts about graduates and young people in general in the context of their use of computers and other technological tools?	The literature identifies the fact that the current generation of young people (Generation Z and beyond) have a facility with technological "gadgets" as they have grown up with them. This makes them different to previous generations.	Theme 3 (Prensky, 2001) (Mintel Group, 2018)
5. How do you rate your own experience in this area?	A large part of the rationale for this thesis is related to the fact that B and M students appear to be much more apprehensive about spreadsheets and databases than they are about more intuitive software, such as social media. I am interested to see if the students themselves feel the same. This is linked to the previous question, and serves to question the belief that confidence with "gadgets" and social media also mean confidence with business computing tools.	Themes 3 and 4 (Universities UK 2015) (Duxbury & Ormsbee, 2017)

I will now give them the Universities UK definition of data literacy.

"*Research design, data collection, data management, data analysis, modelling, interpretation and the presentation of research findings*"

and explain that this is the skillset I am interested in talking about, specifically related to Business.

6. Does this definition fit with the skills you feel that you need to have?	
7. Do you think you actually have these skills?	Linked to previous question
8. Have you ever had a job where these skills are required of you?	This could be a part-time job or any sort of Internship. Unlikely for Level 4 students, but would like to ask the question for parity with the other stakeholder questions.

The next section will concentrate on the students own experience

9. Can you describe your feelings about the data management/IT subjects you have been taught up to now. At University, this will largely have been on the BM9400 module. Think about both content and method of delivery.		Themes 2 and 4 (Alteryx, 2016)
10. How did you perform in your BM9400 exam?		
11. Do you think data literacy skills should be taught as a compulsory part of B and M degree programmes.	Adapted from Data Grammar survey. Their question referred to MBA programmes.	As above
12. Do you feel that you have been taught these skills, either in the above module or elsewhere?	.	Theme 4 (Maggiti, 2015)

13. Have you heard of the term "Knowledge Worker?" What do you think is meant by this term?	This term has been around for a while and I think it is a useful popular description of the kind of worker many of our graduates become. I put this question in, as I thought interviewees would feel comfortable attempting a definition.	Theme 2 (Castells, 2010) (Mutch, 2008) (Richards & Gottlob, 2017)

Appendix 11 University Staff Interview Questions

Question	Rationale	Link to Literature and Themes
1. What is your job within the University?	These are just classification questions – it is not necessary to link them to specific themes.	
2. Which department do you work in?		
3. How long have your worked at the University/in the Business School?		
4. What modules do you teach?		
5. What are your thoughts about graduates and young people in general in the context of their use of computers and other technological tools?	The literature identifies the fact that the current generation of young people (Generation Z and beyond) have a facility with technological "gadgets" as they have grown up with them. This makes them different to previous generations.	Theme 3 (Prensky, 2001) (Mintel Group, 2018)
6. In your experience, what are the skill levels of students with regard to spreadsheets and data management software when they come to University?	A large part of the rationale for this thesis is related to the fact that B and M students appear to be much more apprehensive about spreadsheets and databases than they are about more intuitive software, such as social media. I am interested to see if employers notice the same thing. This is linked to the previous question, and serves to question the belief that confidence with "gadgets" and social media also mean confidence with business computing tools.	Themes 3 and 4 (Universities UK 2015) (Duxbury & Ormsbee, 2017)

I will now give them the Universities UK definition of data literacy.

"*Research design, data collection, data management, data analysis, modelling, interpretation and the presentation of research findings*"

and explain that this is the skillset I am interested in talking about, specifically related to Business.

7. Does this definition fit with the skills you feel that students need to develop as part of their education within the Business School?		
8. Do you think that these are skills which they actually develop during their degree studies?	Linked to previous question	
9. Do you think data literacy skills should be taught as a compulsory part of B and M degree programmes.	Adapted from Data Grammar survey. Their question referred to MBA programmes.	As above
10. Have you heard of the term "Knowledge Worker?" What do you think is meant by this term?	This term has been around for a while and I think it is a useful popular description of the kind of worker many of our graduates become. I put this question in, as I thought interviewees would feel comfortable attempting a definition.	Theme 2 (Castells, 2010) (Mutch, 2008) (Richards & Gottlob, 2017)
11. Do you think you are teaching the subject you teach so that students can become Knowledge Workers?		

Appendix 12 Researcher Statement

Researcher Statement

I am specifically looking at skills in the areas of spreadsheet and database software and I am particularly interested in the ability of students to use such tools to aid planning and decision-making. The following statement is my rationale for carrying out this work:

I have come to academic life a bit later on that most people, having worked from many years as an independent IT Consultant and Trainer. When I started teaching I became aware that many Business students are quite hesitant and lack confidence in the use of data management software (generally spreadsheets and databases) which is my speciality. This surprised me as the general consensus seems to be that young people are very confident with technology. Talking informally to business people I also found that they were often surprised and a little disappointed that some graduates came to work displaying this lack of confidence with spreadsheets etc. which are now part of business life.

I decided to do some research into this and I intend to interview potential employers, some students themselves and relevant academic staff in the Business School with a view to reviewing the way in which we equip our students with data management skills. I hope this helps you to understand my project.

Liz Cunningham

Appendix 13 “FitFace” Case Study

Business Scenario for the Business Information Management (BIM) Module: NX9310

Background

The scenario is based on a fictitious company, ‘FitFace’, who are a well-established fitness & health business that have been in the industry for about 15 years. They are based in the North East of England and currently have 2 outlets, one in Newcastle and one in Sunderland, both based on a similar setup and size. They have always tried to keep up with the times and endeavour to update their facilities as often as they can in order to both maintain existing customers and to attract new customers. They have about 200 members in Newcastle and 150 in Sunderland, and the competition for members in the fitness market is growing.

Challenge

In light of the ever growing threat from existing and new competition FitFace have been advised that they need to start becoming more ‘data savvy’ in the way they operate, and to make more use of data that is available to them to help survive and flourish. As it stands, they don’t have the expertise in-house to identify what they need and how to put an appropriate strategy in place.

Solution

The proposed solution is therefore to contract a consultant to assess their business needs and their customer requirements in order to present them with an information management strategy. You are the consultant and will provide FitFace with a report to include detail on the following key areas:

- Data and Information sources FitFace could use (both internal and external sources)
- MAIN FOCUS: examples of information / intelligence outputs FitFace could develop from the survey findings and any other data sources identified (focus on 3 or 4 in total)
- Brief outline of technology requirements (software and hardware) and any staff training and recruitment needs
- Overall benefits – this should include your final recommendations and justification of the benefits they will bring

Process

As the consultant, you will work with other colleagues to design and carry out a pilot survey of some existing and potential customers of FitFace. This data, coupled with some additional data you will be provided with, will be that which you use to demonstrate the potential outputs of information / intelligence that FitFace could use to aid their decision making. You will use your own skills in data management, analysis and presentation to deliver the findings to the FitFace board in the aforementioned report.

FitFace would like you to provide a short interim summary of your initial findings and recommendations in week 11, where you will be provided with some formative feedback from them. The final report must include greater detail and reflections on the findings, recommendations and process, as outlined above. The submission date for the report will be provided to you in due course.

Appendix 14 Module Descriptor for Level 3 Module

Northumbria University Programme Framework for Northumbria Awards - Module Specification

Faculty	Business and Law	**Department**	Marketing, Operations and Systems (MOS)	**Subject**	Analytics	**Module Tutor**	Philip Oliver		
Module Title	Business Information Management					**Module Code**	NX9310		
Module Type* *(see key below)*	**STAN**								
Module size credits	**Level 3:**	20 credits	**Level 4:**		**Level 5:**		**Level 6:**		**Level 7:**
Home programme/s for which the module is designed			Foundation Year in Business				**Code/s**		

Additional Programme/s other than that/those for which the module for specifically designed					**Code/s**	
Delivery Pattern (Please tick)	**Semester based** *(please specify)*	Sem 1 ☒ Sem 2 ☐	**Year Long**	☐	**Full-time** **Part-time** **Distance Learning**	☒ ☐ ☐
Location(s) of delivery: If delivered at EPWO partners please give partner name and location						

KEY:

APL	*Accreditation for prior learning*	*P/F*	*Pass/fail module*	*PLIN*	*Placement - Industrial*
CORE	*PNVQ core skills module*	*P/F_DS*	*Pass/fail dissertation module*	*PRAC*	*Practical*
DISS	*Dissertation*	*P/F_PJ*	*Pass/fail project module*	*PROJ*	*Project*
FLDW	*Fieldwork*	*P/F_PL*	*Pass/fail placement module*	*STAN*	*Standard module*
INDS	*Independent study*	*PLAY*	*Placement – academic study abroad FT*	*WKBS*	*Work base study*
MAFOUN	*MA foundation modules - ASS*	*PLCL*	*Placement – Clinical*	*WORK*	*Workshop*

Module Overview (Max 250 words per section) (This section is aimed at providing a prospective or current student with a brief overview of the module in answer to the specific questions and will form an element of the module handbook)

What will I learn on this module? (SRS 0001) Please give a brief indication of the content of the module including the main topic / subject areas studied
In this module, you will learn about the practical challenges faced by organisations in creating business information and communicating this information in an understandable way. You will learn about business data, its key sources and how this can be created for specific project purposes through survey design and associated data collection. You will learn how to undertake primary data collection in an ethically appropriate way and how to handle, prepare and analyse your data using analytical tools e.g. Excel. The importance of communication to your business audience is reinforced through verbal and written presentation of your study findings. Within this module, you will cover the following topics: • Introduction to Business Information. • Data and Information Management: sources; types; storage; accessibility. • Data Collection: survey design and distribution, taking account of the different types of data we might want to collect. • Ethical aspects of data collection. • Data Preparation - extracting and importing data to analytical tools e.g. Excel; preparing data for analysis. • Data Analysis and Presentation with analytical tools: converting data into business information and intelligence. • Communicating the Information and Intelligence – using reports and presentations. As an integral part of your learning, you will use “real” data, which you will subsequently learn to manage, prepare and analyse. You will learn how to present your work in verbal and written formats, leading to the development of a 2000 word individual report for your summative assessment.

How will I learn on this module? (SRS 0002) Please provide a brief overview the learning and teaching approaches the student can expect to experience.
The module involves a weekly one hour lecture to introduce the core subject content, and a two hour workshop for practical application of the subject matter. The lecture will introduce you to theoretical concepts associated with the management of business data and information and will equip you with the knowledge necessary to fully address the practical content of the workshop. You should make sure that you are confident with the principles and theories covered in the lecture in order to make best use of the workshop time. During the workshop you will engage with practical exercises, but you will also be able to ask questions of the tutor and confer with your peers in order to clarify your understanding of the topics covered. You will be provided with a teaching and learning plan to direct your reading and preparation which you will be able to access through an online reading list on the modules Blackboard site and through the Library website. There will also be multimedia support available through the teaching and learning plan, where you will be directed to access a range of videos and other resources. During the workshops you will create and save a portfolio of your own personal materials in the form of spreadsheets, charts and documents. These materials will help you in the creation of your individual assessed report. In order to further enhance your skills, you will be encouraged by your lecturer to undertake a significant amount of independent reading, note-making and practice each week for this module.
How will I be supported academically on this module? (SRS 0003) Please provide a brief overview of the academic support available to students, including any support that may be accessed outside formal scheduled teaching.
Academic staff are drawn from a range of disciplines within the Newcastle Business School, many of whom have expertise in Business Analysis & Information Management. In addition, many have extensive professional experience that they bring to your learning experience, whether this is in the way of previous teaching or management practice in a work-based environment. Staff

teaching on this module have a wide range of research interests within the field of data analysis and information management. Where possible, they will use these interests to further inform the content of the module and ensure that such content is relevant and up to date.

The directed activities you undertake on the module are designed to ensure that you support, consolidate and enhance the knowledge gained in the lectures and workshops. They will encourage you to create an active and self-directed learning experience, that will allow you to take responsibility for your own learning, whilst still having a high level of support. Support will be provided to you by members of academic staff on the module team i.e. those teaching on the module and providing the lectures and workshops. This support will also allow you to work collaboratively with your peers, particularly in workshops and during self-directed learning activities. You will also have the support of the programme leader and student support team at the University.

Your module is supported by an e-learning portal (Blackboard Ultra), which hosts the teaching and learning plan, learning materials and recordings, workshop and seminar exercises, assessment information, and details of additional resources such as online recordings and videos. It is also frequently used for electronic assessment submissions and the subsequent release of marks and feedback.

The module's online reading list can also be reached through the Blackboard Ultra site. This provides you with a comprehensive list of links from which to access all the modules' eBooks, news resources, and directed learning academic articles. The module's Blackboard site also has an announcement board and email facility, which the module tutor and team will use to communicate important information about the module throughout the semester. Blackboard Ultra is central to your learning journey as it is a one-stop location for resources and guidance, and we therefore expect all students to check-in to it on a regular basis. There is also a one-hour weekly drop-in webinar session available for you to attend and contribute to as part of the module support.

What will I be expected to read on this module? (SRS 0004) All modules at Northumbria include a range of reading materials that students are expected to engage with. The reading list for this module can be found at: http://readinglists.northumbria.ac.uk

[Morris, C. (2012) Quantitative Approaches in Business Studies, 8th edition, FT Prentice Hall]

(Reading List service online guide for academic staff, this contains contact details for the Reading List team – http://library.northumbria.ac.uk/readinglists)

Northumbria University Library Reading List Service (please confirm the following)	**Please give date added**
A draft reading list has been created and on the university Library Reading List Service	Click here to enter a date.
Reading material has been acquired and digitised (following approval)	Click here to enter a date.
Reading list has been published to students (for module delivery)	Click here to enter a date.

NB – for PFNA alignment process only, module authors should complete either the University Library e-Reading List, or Appendix 1.

Module Learning Outcomes (MLOs) *(Max of five in total*, for standard 20-credit modules)*

What will I be expected to achieve? (SRS 0005) **Knowledge & Understanding:** • Develop and implement a survey instrument to collect primary data for a pre-defined project/study **[MLO1]** • Handle, prepare and analyse the survey data for presentation to a business audience **[MLO2]** **Intellectual / Professional skills & abilities:** • Develop and implement team working protocols in the design and dissemination of a survey instrument and presentation of the key findings from the study **[MLO3]**	**How will I be assessed?** (SRS 0006) *Please give details of all formative and summative assessment process indicating which MLOs will be addressed and how feedback will be provided*. The module will comprise both **formative** and **summative** assessment. For **formative** assessment, you will gain group and one-to-one feedback on the development of your Excel skills within the IT workshops from your tutor. In the creation of your group-based survey instrument, formative assessment will cover the ethical dimensions of your study, the development and testing of your study instrument, the outcomes of piloting and instrument deployment involving both academic and peer inputs. As a team, you will give a presentation on your group work and key findings based on your preliminary analysis,	**Programme (Level) Learning Outcomes that this module contributes to:** *[Please insert PLO number as listed on the programme specification]* **Knowledge & Understanding:** • Develop the skills to enable business and management problems to be analysed and understood with reasonable possible resolutions explored. **[3.1.2]** **Intellectual / Professional skills & abilities:** • Demonstrate the development of interpersonal communication skills and an awareness of the necessary skills to work in multi-cultural teams. **[3.2.1]**

Personal Values Attributes (Global / Cultural awareness, Ethics, Curiosity) (PVA): • Develop an understanding of business research and the role played by surveys and primary data collection **[MLO4]**	gaining feedback through question/answer sessions from your tutor and fellow students, with face-to-face feedback. For **summative** assessment, you will submit a 2000 word individual report based on the group-based survey exercise and the subsequent data analysis. This summative assessment will cover all the module learning outcomes (MLOs 1-4 inclusive).	**Personal Values Attributes** (Global / Cultural awareness, Ethics, Curiosity) (PVA): • Develop the curiosity to research business problems and undertake business projects. **[3.3.1]**

Pre-requisite(s) (SRS 0007) Any module which must already have been taken, or any stipulated level of prior knowledge required in order to study this module, (co-requisite core models need not be listed	None
Co-requisite(s) (SRS 0008) Modules at this level which must be taken with this module	None

Module abstract (SRS 0009)

Please provide a brief a brief abstract of the module (150 words max). This section acts as the 'shop window' for the module, therefore it needs to engage and inspire the student. This is the first thing that the student will read about this module, so it must immediately grab their attention.

The main aim is to encourage the student to read on, however the summary should be written in such a way that if the student reads nothing else this section will convey all key messages and benefits that the module will offer. Start by explaining the module title where necessary. Then highlight any selling points relating to the four pillars: Research-Rich Learning; Technology Enhanced Learning; Assessment and Feedback; Employability and Entrepreneurship. Examples may include student satisfaction rates, learning environment, state-of-the-art facilities etc. Finally indicate benefits of the module such as the key skills that the students will gain for future employment and career paths that are open to them.
Providing businesses with information to understand its key activities is crucial, as is the communication of this information. This module provides a practical introduction to the creation and communication of business information. The module develops attributes essential for both undergraduate study and for entering employment at the graduate level. These include teamwork, introductory research skills, data handling, information and data literacy (developing competency in analytical tools, e.g. Excel), interpreting your analysis, and communication to a business audience. The module's practical focus provides experience of various dimensions of the management, analysis and dissemination of business information and research findings, with the assessment being centred on learning by application and demonstrating the attributes described. These attributes provide an important foundation for your learning on this programme and in subsequent University study. The module allows you to experience various dimensions of research-rich learning, being research oriented in developing an understanding of research processes and enquiry-based through the practice of data collection, analysis and presentation.

Programme Framework for Northumbria Awards Research Rich Learning Design Pillar (SRS 0090)

Embedding Research Rich Learning into the curriculum: Indicate how students will be actively engaged in research rich learning in this module through: research/enquiry based learning, research tutored learning, research led learning and/or research oriented learning, providing a brief overview of how this / these will feature within the delivery of the module (250 words max)

Note:

- **Research/enquiry Based:** L&T Based on student-centred enquiry and research activities (conducting research).
- **Research Tutored**: L&T Emphasises learning focused on students actively discussing research, and critically engaging with research outputs
- **Research Led**: T&L structured around subject content and that content is based on the research (learning about research)
- **Research Orientated:** T&L Emphasises understanding of the knowledge production process, and methods of enquiry in the subject (learning how to research)

The module provides you with an introduction to survey-based research which is central to both scheduled teaching, individual and group work, and formative and summative assessment that forms your study.

In both lectures and IT workshops, you will develop knowledge, skills and competencies in the development of a study instrument, learning how to undertake research ethically and responsibly. You will consider instrument piloting, storing and preparing data for analysis and developing and implementing a plan of data analysis appropriate to the data collected. In learning about this comprehensive process of knowledge production, you will experience a research-oriented approach within your learning.

The deployment of your group-based survey instrument and the subsequent collection, storage, handling and analysis of the data generated represent a “real” student-centred enquiry where you are active participants in a research project where you are both leading and conducting this activity. This represents your introduction to enquiry-based research. These activities provide a building block on which you can develop enquiry-based approaches to study which will feature as you progress through your undergraduate studies.

Notional Student Workload (NSW) for each mode of delivery

Complete for each delivery mode where the distribution of NSW **Full Time Mode of Delivery**				**Part Time Mode of Delivery**			
Activity type	**Hours**	KIS category	KIS category hours		**Hours**	KIS category	KIS category hours
Lecture	12	Scheduled	48	Lecture		Scheduled	
Seminar (Webinar)	12			Seminar			
Tutorial				Tutorial			
Project Supervision				Project Supervision			
Demonstration				Demonstration			
Practical classes and workshops	24			Practical classes and workshops			
Supervised time in studio/ workshop				Supervised time in studio/ workshop			
Fieldwork				Fieldwork			
External visits				External visits			
Tutor guided independent learning	48	Independent	152	Tutor guided independent learning		Independent	
Student independent learning	104			Student independent learning			
Placement		Placement	0	Placement		Placement	
Study abroad				Study abroad			

Work based learning				Work based learning			
Total workload *200 hours for 20 credit module*	*200*		*200*	**Total workload**			

Note: the 12 hours seminar activity are a 1-hour weekly supporting webinar/virtual drop in session.

Summative Assessment

Sequence *001, 002 etc.*	**Activity type** *indicate **ONE** of the following types:*	**Brief description of assessment (max.120 characters)** *e.g. type/ length of exam, type/ word limit of coursework*	**Weighting** % or Pass/Fail (for grade only components) *Note: % weightings should add up to 100% for module overall*	**Final assessment**		**Anonymous submission**		**ESAF submission**	
				Yes	*No*	*Yes*	*No*	*Yes*	*No*
001	CW (Coursework)	A 2000 word individual report based on a group-based survey exercise	100% weighting	☒	☐	☐	☒	☒	☐

Reassessment (specify either synoptic or non-synoptic)

Synoptic reassessment *One form of reassessment that tests all module learning outcomes*	Yes	☐	No	☒
Non-synoptic reassessment *Where module referred overall, individual failed components of assessment are reassessed*	Yes	☒	No	☐

FOR OFFICE USE ONLY

Date of FPARSC Approval	Click here to enter a date.

Date of entry onto SITS	Click here to enter a date.		
LOG OF CHANGES POST-APPROVAL Please indicate any changes to the approved module descriptor from 2012/13 onwards			
Section No.	**Brief description of change**	**Date of Approval**	**Semester and year of first implementation**
		Click here to enter a date.	

		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	

Appendix 1

Indicative Reading for PFNA alignment approval only *(to be completed only if e-reading list unavailable at point of alignment approval)*

N.B. This outline indicative reading list will be utilised for approval purposes only, and **a full e-reading list must be produced and available by the June of the academic year prior to the first delivery date of the module** (at which point the section of p.2 referring to University Library Reading Lists should be completed).

Please list below essential key text underpinning the module content and ultimately the learning outcomes:

Core Text:

Morris, C. (2012) Quantitative Approaches in Business Studies, 8th edition, FT Prentice Hall.

Appendix 15 Module Descriptor for Level 4 Module

Northumbria University Programme Framework for Northumbria Awards - Module Specification

Faculty	Business and Law	**Department**	Marketing, Operations and Systems (MOS)	**Subject**	Analytics	**Module Tutor**	Philip Oliver		
Module Title	Business Analysis for Decision Making					**Module Code**	BM9403		
Module Type* *(see key below)*	**STAN**								
Module size credits	**Level 3:**		**Level 4:**	20 credits	**Level 5:**		**Level 6:**		**Level 7:**
Home programme/s for which the module is designed	BA(Hons) Marketing BA(Hons) Business and Marketing BA(Hons) Business Management BA(Hons) Business and Human Resource Management BA(Hons) Tourism and Events Management BA(Hons) Business and Entrepreneurship BA(Hons) Entrepreneurship BA(Hons) International Business Management						**Code/s**		
Additional Programme/s other than that/those for which the module for specifically designed							**Code/s**		
Delivery Pattern (Please tick)	**Semester based**	Sem 1 ☒		**Year Long**	☐	**Full-time** **Part-time**	☒ ☐		

	(please specify)	Sem 2 ☒			**Distance Learning**	☐
Location(s) of delivery: If delivered at EPWO partners please give partner name and location						

***KEY:**

APL	*Accreditation for prior learning*	*P/F*	*Pass/fail module*	*PLIN*	*Placement - Industrial*
CORE	*PNVQ core skills module*	*P/F_DS*	*Pass/fail dissertation module*	*PRAC*	*Practical*
DISS	*Dissertation*	*P/F_PJ*	*Pass/fail project module*	*PROJ*	*Project*
FLDW	*Fieldwork*	*P/F_PL*	*Pass/fail placement module*	*STAN*	*Standard module*
INDS	*Independent study*	*PLAY*	*Placement – academic study abroad FT*	*WKBS*	*Work base study*
MAFOUN	*MA foundation modules - ASS*	*PLCL*	*Placement – Clinical*	*WORK*	*Workshop*

Module Overview (Max 250 words per section) (This section is aimed at providing a prospective or current student with a brief overview of the module in answer to the specific questions and will form an element of the module handbook)

What will I learn on this module? (SRS 0001) Please give a brief indication of the content of the module including the main topic / subject areas studied

In this module, you will develop the knowledge and skills in applying a variety of quantitative data analysis techniques to support business decision making. You will be introduced to business modelling using appropriate analytical tools, and your learning will cover a range of techniques to help business forecasting and data presentation.

In this module you will be exposed to a range of data analysis tools and skills, including:

- Business Analysis and Modelling: management of complex and varied data sets; building spreadsheet models.
- Data Trends and Associations e.g. identifying relationships between business variables.
- Business Forecasting and Predictive Modelling – analysing factors and trends for business planning.
- Business and Dashboard reporting – consolidation, interpretation and presentation of data for professional output.
- Data distribution, data presentation and using summary statistics – handling a range of data for statistical analysis.
- Gaining an understanding of the overlap between business and research data and the selection of appropriate tools for management of both types of data.

Working with these analysis tools, you will learn to develop confidence in dealing with a wide range of data sets. You will become familiar with the role of modelling as an aid to problem solving and will build skills which enable you to interpret data and

present your findings to a range of audiences. Very importantly, you will gain a good understanding of the crucial role that analysis of data and interpretation of results plays in the decision-making arena.

How will I learn on this module? (SRS 0002) Please provide a brief overview the learning and teaching approaches the student can expect to experience.

The one-hour weekly lectures will provide you with a theoretical underpinning for your learning, supported by two-hour weekly IT workshops which will give you an opportunity to practice the various analytical techniques, allowing you to build up a proficiency in the use of Excel spreadsheets and the necessary skills of interpretation and communication of findings. These workshops will be tailored to your programme of study through the practical examples set being linked to your subject discipline. You will be able to follow up on these lectures and IT workshops through a one-hour weekly webinar with the members of the teaching team and fellow students to reinforce both the practical and theoretical learning.

There will be several additional exercises located on the module's e-learning portal that will permit you to undertake further practice independently. The module has a supporting reading list that provides you with an opportunity to see how the various decision making and analytical techniques are applied to further managerial and research-based problems, as well as reference to a core text that will support your learning with further reading and practical examples.

Your directed study will support the work you have undertaken in the contact sessions. You will be expected to keep up-to-date with your IT workshop exercises. In addition, you will be set a selection of exercises to complete. To aid with self-assessment on progress, solutions to these exercises will be made available to you on the e-learning portal.

Independent learning time is set aside for learning activities, self-identified by you, to gain a deeper and broader knowledge of the subject. You may complete the review exercises, work with the electronic support tools (such as recordings of IT applications), attempt to complete past examination papers or undertake further reading.

How will I be supported academically on this module? (SRS 0003) Please provide a brief overview of the academic support available to students, including any support that may be accessed outside formal scheduled teaching.

Support will be provided to you by a member of academic staff leading the module and providing the lecture input. A team of academic staff are allocated IT workshop groups of about 20 students, which provides closer, more personal academic support. These IT workshop groups are typically based on study programme cohorts, so you will be taught here alongside fellow members from your specific programme. The final aspect of the direct contact support is a 1-hour weekly webinar, where students can link

with the module tutor and other members of the teaching team to engage in question and answer sessions on the module materials and assessment brief.

Your module is supported by an e-learning portal, which hosts lecture materials, IT workshops exercises and data files, alongside assessment details and various support facilities such as recordings of certain lectures and IT applications, alongside other electronic support facilities such as the module reading list.

You will have a wide-ranging electronic reading list that comprises of various textbooks whose contexts will reinforce the lecture and IT workshop inputs, alongside academic reports, conference papers and journal articles that showcase the application of various quantitative techniques presented in the module.

The module assessment consists of several inter-related tasks which will be distributed throughout your teaching semester. This will encourage your active participation in the learning process throughout the semester. The e-learning portal will permanently host these tasks after release to ensure that you can always access the information required. Your work on these tasks will be the pre-work for a 2-hour unrestricted (open notes) examination at the end of the module.

What will I be expected to read on this module? (SRS 0004) All modules at Northumbria include a range of reading materials that students are expected to engage with. The reading list for this module can be found at: http://readinglists.northumbria.ac.uk

See Appendix 1.

(Reading List service online guide for academic staff, this contains contact details for the Reading List team – http://library.northumbria.ac.uk/readinglists)

Northumbria University Library Reading List Service (please confirm the following)	**Please give date added**
A draft reading list has been created and on the university Library Reading List Service	Click here to enter a date.
Reading material has been acquired and digitised (following approval)	Click here to enter a date.
Reading list has been published to students (for module delivery)	Click here to enter a date.

NB – for PFNA alignment process only, module authors should complete either the University Library e-Reading List, or Appendix 1.

Module Learning Outcomes (MLOs) *(Max of five in total*, for standard 20-credit modules)*
**this can increase to a maximum of 10, for modules with more than 20 credits*

What will I be expected to achieve? (SRS 0005)	**How will I be assessed?** (SRS 0006) *Please give details of all formative and summative assessment process indicating which MLOs will be addressed and how feedback will be provided*.	**Programme (Level) Learning Outcomes that this module contributes to:** *[Please insert PLO number as listed on the programme specification]*
Knowledge & Understanding: • Understand a variety of introductory statistical techniques and their application to the analysis and interpretation of business data for a variety of organisational applications. **[MLO1]** • Understand and demonstrate the role of modelling as an aid to decision making; through the selection of models and techniques to assist in the solution of business problems. **[MLO2]** • Develop an understanding of how data analysis can inform business decision making **[MLO3]**	Formative assessment will be provided on an ongoing basis throughout the module, where feedback will be provided during the practical IT workshop classes relating to the activities being undertaken, with further support being provided by the posting of outline solutions to these exercises on the e-learning portal. Further formative feedback will be supported through posted recordings, particularly in the support of IT applications. The weekly webinar sessions are a further channel for formative feedback on both the theoretical and practical aspects of the module and on the tasks that underpin the summative assessment. The summative module assessment consists of several inter-related tasks which will be distributed throughout your teaching semester. This will encourage your active participation in the learning process throughout the semester,	**BA(Hons) Marketing** **Knowledge & Understanding:** • Identify contemporary professional practice in marketing and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of marketing to solve complex problems related to professional practice, thereby identifying justifiable solutions. **[PLO 4.1.2]** **BA(Hons) Business and Marketing** **Knowledge & Understanding:** • Identify contemporary professional practice in business and marketing and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of business and marketing to solve complex problems related to professional

	thereby providing ongoing feedback on your understanding of the module content. The eLearning portal will be used to permanently host these tasks after release to ensure that you can always access the information required. Your work on these tasks will provide you with further chance to practice the various areas of data analysis and modelling, as well as forming the pre-work for a 2-hour examination at the end of the module. This examination forms the summative assessment and represents 100% of the module mark. It will be based on a set of short answer questions covering all the pre-work tasks completed and will be in an unrestricted (open notes) format. This will assess **MLO1, MLO2** and **MLO3.**	practice, thereby identifying justifiable solutions. **[PLO 4.1.2]** **BA(Hons) Business Management** **Knowledge & Understanding:** • Identify contemporary professional practice in business and management and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of business and management to solve complex problems related to professional practice, thereby identifying justifiable solutions. **[PLO 4.1.2]** **BA(Hons) Business and Human Resource Management** **Knowledge & Understanding:** • Identify contemporary professional practice in business and HRM and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of business and HRM to solve complex problems related to professional practice, thereby identifying justifiable solutions. **[PLO 4.1.2]**

		BA(Hons) Tourism and Events Management **Knowledge & Understanding:** • Identify contemporary professional practice in tourism and events and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of tourism and events to solve complex problems related to professional practice, thereby identifying justifiable solutions. **[PLO 4.1.2]** **BA(Hons) Business and Entrepreneurship** **Knowledge & Understanding:** • Identify contemporary professional practice in entrepreneurship and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of entrepreneurship to solve complex problems related to professional practice, thereby identifying justifiable solutions. **[PLO 4.1.2]** **BA(Hons) Entrepreneurship** **Knowledge & Understanding:**

		• Identify contemporary professional practice in entrepreneurship and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of entrepreneurship to solve complex problems related to professional practice, thereby identifying justifiable solutions. **[PLO 4.1.2]** **BA(Hons) International Business Management** **Knowledge & Understanding:** • Identify contemporary professional practice in international business and understand how it is informed by theory and research. **[PLO 4.1.1]** • Use knowledge of international business to solve complex problems related to professional practice, thereby identifying justifiable solutions. **[PLO 4.1.2]**

Pre-requisite(s) (SRS 0007) Any module which must already have been taken, or any stipulated level of prior knowledge required in order to study this module, (co-requisite core models need not be listed	None
Co-requisite(s) (SRS 0008) Modules at this level which must be taken with this module	None

Module abstract (SRS 0009)

Please provide a brief a brief abstract of the module (150 words max). This section acts as the 'shop window' for the module, therefore it needs to engage and inspire the student. This is the first thing that the student will read about this module, so it must immediately grab their attention. The main aim is to encourage the student to read on, however the summary should be written in such a way that if the student reads nothing else this section will convey all key messages and benefits that the module will offer. Start by explaining the module title where necessary. Then highlight any selling points relating to the four pillars: Research-Rich Learning; Technology Enhanced Learning; Assessment and Feedback; Employability and Entrepreneurship. Examples may include student satisfaction rates, learning environment, state-of-the-art facilities etc. Finally indicate benefits of the module such as the key skills that the students will gain for future employment and career paths that are open to them.
The module will equip you with skills to help you when dealing with analytical content in future study and employment, either work placement or graduate role, with an appropriate level of understanding and proficiency in some commonly used analytical business applications. The module will provide you with a theoretical understanding of various business modelling and data handling applications supported through practical tutor-led workshops. You will be assessed on your understanding and proficiency in data management, analysis and presentation using appropriate tools. The assessment will aim, wherever possible, to simulate "real-world" tasks and scenarios. You will therefore be required to work on a series of tasks over the course of the semester in preparation for the final assessment. The data-handling and interpretative skills learned on this module are directly transferable to your further academic study and working life and are vital in a wide range of graduate roles. The skills and tools identified for use in the module are based upon research and collaboration with a variety of businesses. In line with this, and to deepen your understanding of the practical content of the module, you will also be expected to engage in additional reading to aid your understanding of the importance of the use of data modelling, analysis and interpretation in both business and academic settings, thereby engaging in research-led learning.

Programme Framework for Northumbria Awards Research Rich Learning Design Pillar (SRS 0090)

Embedding Research Rich Learning into the curriculum: Indicate how students will be actively engaged in research rich learning in this module through: research/enquiry based learning, research tutored learning, research led learning and/or research oriented learning, providing a brief overview of how this / these will feature within the delivery of the module (250 words max)

Note:

- **Research/enquiry Based:** L&T Based on student-centred enquiry and research activities (conducting research).
- **Research Tutored**: L&T Emphasises learning focused on students actively discussing research, and critically engaging with research outputs
- **Research Led**: T&L structured around subject content and that content is based on the research (learning about research)
- **Research Orientated:** T&L Emphasises understanding of the knowledge production process, and methods of enquiry in the subject (learning how to research)

The research built into this module is predominantly research led, where you will learn about research through wider subject reading related to the managerial and research applications of the various analytical and decision making techniques presented within the module.

There is a reading list covering each of the topics presented in the module. This reading list will comprise textbooks and research publications.

The textbooks will provide further reading about the tools and techniques presented in the module's lectures and IT workshops and how the associated analysis can be executed using accessible business software such as Excel, with business applications central to this additional reading. In learning about these applications and their analysis, interpretation and business relevance, you will experience research-oriented learning.

The journal articles and reports that comprise the research publications in the reading list cover various managerial and research applications, thereby showcasing to you the wide level of application and relevance of the subject to the broad business and management discipline. This additional reading, based on research, will help you develop an understanding into how research is conducted and how the content of this module supports this work and the associated researchers in terms of tools and techniques for data analysis and modelling. Your additional reading further supports your knowledge generation across the subject discipline and provides you with experience of research-led learning.

Notional Student Workload (NSW) for each mode of delivery

Complete for each delivery mode where the distribution of NSW **Full Time Mode of Delivery**				**Part Time Mode of Delivery**			
Activity type	**Hours**	KIS category	KIS category hours		**Hours**	KIS category	KIS category hours
Lecture	12	Scheduled	48	Lecture		Scheduled	
Webinar	12			Seminar			
Tutorial				Tutorial			
Project Supervision				Project Supervision			
Demonstration				Demonstration			
Practical classes and workshops	24			Practical classes and workshops			
Supervised time in studio/ workshop				Supervised time in studio/ workshop			
Fieldwork				Fieldwork			
External visits				External visits			
Tutor guided independent learning	48	Independent	152	Tutor guided independent learning		Independent	
Student independent learning	104			Student independent learning			
Placement		Placement	0	Placement		Placement	
Study abroad				Study abroad			
Work based learning				Work based learning			
Total workload *200 hours for 20 credit module*	*200*		*200*	**Total workload**			

Summative Assessment

Sequence *001, 002 etc.*	**Activity type** *indicate **ONE** of the following types:*	**Brief description of assessment (max.120 characters)** *e.g. type/ length of exam, type/ word limit of coursework*	**Weighting** % or Pass/Fail (for grade only components) *Note: % weightings should add up to 100% for module overall*	**Final assessment**		**Anonymous submission**		**ESAF submission**	
				Yes	*No*	*Yes*	*No*	*Yes*	*No*
001	EXAM (Written examination)	This is a 2-hour, unrestricted examination using pre-work based on various Excel-based analytical tasks	100%	☒	☐	☒	☐	☐	☒
002	Choose an item.			☐	☐	☐	☐	☐	☐
003	Choose an item.			☐	☐	☐	☐	☐	☐
004	Choose an item.			☐	☐	☐	☐	☐	☐
005	Choose an item.			☐	☐	☐	☐	☐	☐
006	Choose an item.			☐	☐	☐	☐	☐	☐
007	Choose an item.			☐	☐	☐	☐	☐	☐
008	Choose an item.			☐	☐	☐	☐	☐	☐
009	Choose an item.			☐	☐	☐	☐	☐	☐
010	Choose an item.			☐	☐	☐	☐	☐	☐
011	Choose an item.			☐	☐	☐	☐	☐	☐
012	Choose an item.			☐	☐	☐	☐	☐	☐

Reassessment (specify either synoptic or non-synoptic)

Synoptic reassessment *One form of reassessment that tests all module learning outcomes*	Yes	☐	No	☒
Non-synoptic reassessment *Where module referred overall, individual failed components of assessment are reassessed*	Yes	☒	No	☐

Indicative Reading for PFNA alignment approval only *(to be completed only if e-reading list unavailable at point of alignment approval)*

N.B. This outline indicative reading list will be utilised for approval purposes only, and **a full e-reading list must be produced and available by the June of the academic year prior to the first delivery date of the module** (at which point the section of p.2 referring to University Library Reading Lists should be completed).

Please list below essential key text underpinning the module content and ultimately the learning outcomes:

Core Text

Morris, C. (2012) Quantitative Approaches in Business Studies, 8th edition, FT Prentice Hall

Supplementary Texts

Davis, G & Branko, P (2010), Business Statistics using Excel, Pearson

Guffy, ME & Loewy, D (2012), Essentials of Business Communication (9th Edition), South Western (Cengage Learning)

Rowntree, D (2004), Statistics without Tears, Financial Times, Prentice Hall

Smailes, J & McGrane, A (2000), Essential Business Statistics, Pearson Education

Triola, M (2007), Elementary Statistics using Excel, Pearson

Waters, D (2008), Quantitative Methods for Business, Oxford University Press

Whigham, D (2007), Business Data Analysis using Excel, Oxford University Press

Winston, Wayne, L. (2019), Microsoft Excel 2019: Data Analysis and Business Modelling, Pearson Education

Wisniewski, M. (2009), Quantitative methods for Decision Makers (5th Edition), FT Prentice Hall

Research Reports

Robson, A. and Hart, D.J. (2019). Charitable Donations: Home and Away. Research Report Produced in Partnership with the Marketing Trust. ISBN: 978-1-5272-4410-8. Published 2019.

Hart, D.J. and Robson, A. (2017). *Charity Begins at Home: Understanding the role of national identity on propensity to donate to local, national and international charities*. Research Report Produced in Partnership with the Marketing Trust. ISBN: 978-1-5272-0978-7. This report is published as an e-book by David Hart Publishing.

Journal Papers

Brown, D. M., Robson, A., and Charity, I. (2018). International Masters' student perspectives of team business simulations. The International Journal of Management Education.

Sainidis, E., Robson, A., and Heron, G. (2019). Environmental turbulence and the role of business functions in the manufacturing strategy debate: The case of UK-based SMEs and the Great Recession. Journal of General Management, 44(4), 190-208.

Websites and Blogs

The datapine Blog, available at https://www.datapine.com/blog/

Lebied, Mona (2018), *A Guide To The Methods, Benefits & Problems of The Interpretation of Data*, available at [last accessed May 2020]:
https://www.datapine.com/blog/data-interpretation-methods-benefits-problems/

Bradford L. (2018), *Why All Employees Need Data Skills In 2019 (And Beyond),* available at [last accessed May 2020]:
https://www.forbes.com/sites/laurencebradford/2018/10/11/why-all-employees-need-data-skills-in-2019-and-beyond/#38a67473510f

Appendix 16 - Module Descriptor for Level 5 module

Northumbria University Programme Framework for Northumbria Awards - Module Specification

Faculty	Business and Law	**Department**	Marketing, Operations and Systems (MOS)	**Subject**	Analytics	**Module Tutor**	Liz Cunningham		
Module Title	Business Research and Analysis					**Module Code**	BM9501		
Module Type* *(see key below)*	**STAN**								
Module size credits	**Level 3:**		**Level 4:**		**Level 5:** 20 credits	**Level 6:**		**Level 7:**	
Home programme/s for which the module is designed	BA (Hons) Marketing BA (Hons) Business and Marketing						**Code/s**		
Additional Programme/s other than that/those for which the module for specifically designed	None						**Code/s**		
Delivery Pattern (Please tick)	**Semester based** *(please specify)*	Sem 1 ☐ Sem 2 ☒	**Year Long**	☐	**Full-time** **Part-time** **Distance Learning**	☒ ☐ ☐			
Location(s) of delivery: If delivered at EPWO partners please give partner name and location									

KEY:

APL	*Accreditation for prior learning*	*P/F*	*Pass/fail module*	*PLIN*	*Placement - Industrial*
CORE	*PNVQ core skills module*	*P/F_DS*	*Pass/fail dissertation module*	*PRAC*	*Practical*
DISS	*Dissertation*	*P/F_PJ*	*Pass/fail project module*	*PROJ*	*Project*

FLDW	*Fieldwork*	*P/F_PL*	*Pass/fail placement module*	*STAN*	*Standard module*
INDS	*Independent study*	*PLAY*	*Placement – academic study abroad FT*	*WKBS*	*Work base study*
MAFOUN	*MA foundation modules - ASS*	*PLCL*	*Placement – Clinical*	*WORK*	*Workshop*

Module Overview (Max 250 words per section) (This section is aimed at providing a prospective or current student with a brief overview of the module in answer to the specific questions and will form an element of the module handbook)

What will I learn on this module? (SRS 0001) Please give a brief indication of the content of the module including the main topic / subject areas studied
In this module you will experience a comprehensive coverage of research methods and analysis that will prepare you both for work placement or study abroad opportunities alongside preparation for your final-year "capstone" research module of either Dissertation, Management Enquiry or Consultancy Project. You will learn how to develop a research question, and linked to this, be able to choose an appropriate method of research, dovetailing both learning experiences to the development of a critical assessment of the academic literature. You will gain a basic understanding of research philosophy, whilst the coverage and importance given to research ethics will play an important part of your learning within the module and you will appreciate as part of your learning how this underpins research of quality and integrity. The role of Ethics in research will cover study design, participant selection, dat a collection, data handling and storage and presentation of research findings. You will learn how to apply quantitative and qualitative methods. In the quantitative applications, you will learn about questionnaire design, sampling, presenting and summarising data, statistical inference and hypothesis testing. You will have the opportunity to use a range of appropriate software tools, such as SPSS (or an equivalent). You learn to as well appreciate the importance of survey and questionnaire piloting. In the qualitative part of the module, techniques covered will include interviewing, focus groups and visual methods to generate data, supported by appropriate analysis methods. You will learn how to execute a critical and effective analysis of your research data for both approaches,
How will I learn on this module? (SRS 0002) Please provide a brief overview the learning and teaching approaches the student can expect to experience.
You will learn through a combination of formal sessions (lectures, seminars, IT workshops and webinars), tutor-directed study and independent reading. The seminars, IT workshops and webinars will be highly interactive and will draw upon the directed learning undertaken, your own marketing-related experiences and discipline expertise of the academic team. These interactive sessions will centre on high levels of participation, both individually and within small groups. The IT workshop or seminar sessions facilitate practice with the methods and techniques covered. This will allow you to learn through practice for both work involving quantitative data and using statistical software such as SPSS (or an equivalent) for analysis, or for conducting interviews and considering how to analyse the qualitative data that is generated.

Several lecture sessions will be used to communicate vital areas for Northumbria University including the University Ethics policy and to provide marketing-specific input which may be helpful in providing guidance on possible areas for your choice of topic in the Dissertation or Management Enquiry.

Directed learning will centre upon a range of activities including pre-reading and preparation for interactive activities. Independent learning will centre upon you identifying and pursuing areas of interest within the marketing discipline, to inform the writing of your research proposal. Critical reflection on knowledge, experience and practice underpins the learning and teaching philosophy on this module along with the explicit development of competence, both of which you will develop into a reflective statement as part of the module's summative assessment. This independent learning will be further supported by various online materials housed within the module eLP, comprising recordings of key lectures, IT workshops, seminars and development of the summative assessment.

How will I be supported academically on this module? (SRS 0003) Please provide a brief overview of the academic support available to students, including any support that may be accessed outside formal scheduled teaching.

You will be supported by the module tutor who is an academic lead for the module, in addition to an academic teaching comprising subject experts from the marketing discipline. This academic teaching team will lead on lectures, IT workshops, seminars and webinars. The IT workshops and seminars will be in small groups so that there is opportunity for exploring the subject matter in detail with both the academic staff and your fellow students.

A comprehensive eLP site will store the materials needed for the lectures, IT workshops and seminars, alongside a detailed week-by-week learning and teaching plan to guide you through the module. There is an electronic reading list indicating the core texts which cover research methods and data analysis, alongside reference to various recommended marketing-related journals and business and management databases, which you should access as the module progresses. You also make use of statistical analysis software (SPSS or equivalent) for analysing quantitative data as part of the module. The eLP site will also provide a blended approach to learning housing various recordings of the module lectures and key seminar/IT workshop interventions that further support the classroom based study within the module.

You will be supplied with formative feedback through seminar and IT workshop discussion and reflection, further supported by the weekly webinar, which is a 1-hour weekly session with member(s) of the teaching team and fellow students. Formative feedback will be provided throughout the module, particularly in relation to seminar and IT tasks where the practical aspects of the module will offer you opportunities to give and receive feedback from your tutors and fellow students. There will be opportunities for you to discuss your potential research idea with staff who have expertise in the marketing discussion, through the seminar and

webinar activities. This will provide you with formative feedback on your research proposal and will help you to develop your summative assessment.
What will I be expected to read on this module? (SRS 0004) All modules at Northumbria include a range of reading materials that students are expected to engage with. The reading list for this module can be found at: http://readinglists.northumbria.ac.uk See Appendix 1. (Reading List service online guide for academic staff, this contains contact details for the Reading List team – http://library.northumbria.ac.uk/readinglists)

Northumbria University Library Reading List Service (please confirm the following)	**Please give date added**
A draft reading list has been created and on the university Library Reading List Service	Click here to enter a date.
Reading material has been acquired and digitised (following approval)	Click here to enter a date.
Reading list has been published to students (for module delivery)	Click here to enter a date.

NB – for PFNA alignment process only, module authors should complete either the University Library e-Reading List, or Appendix 1.

Module Learning Outcomes (MLOs) *(Max of five in total*, for standard 20-credit modules)*
**this can increase to a maximum of 10, for modules with more than 20 credits*

What will I be expected to achieve? (SRS 0005)	**How will I be assessed?** (SRS 0006) *Please give details of all formative and summative assessment process indicating which MLOs will be addressed and how feedback will be provided*.	**Programme (Level) Learning Outcomes that this module contributes to:**
Knowledge & Understanding: • Identify a research opportunity or business enquiry related to marketing and develop a research proposal. **[MLO1]** **Intellectual / Professional skills & abilities:** • Reflect on your experiences in developing a research capability to inform future work and academic study. **[MLO2]** • Demonstrate your skills to undertake a research-based study in the marketing discipline that informs project work at your next level of study. **[MLO3]** **Personal Values Attributes** (Global / Cultural awareness, Ethics, Curiosity) (PVA): • Develop a marketing-related working proposal and project plan to lead to a research project in your final year of study. **[MLO4]**	You will receive formative feedback from marketing academics on your research proposal. This will involve face-to-face feedback and will take place during the seminars on the module, where you will also be able to share research ideas and project plans with fellow students. The weekly webinar will also provide further opportunity for academic and peer discussion and formative feedback. The summative assessment is a 2,500 individual assignment and reflective statement that provides a research plan for Level 6 study. These are based on your ***initial*** choice of either a Dissertation or Management Enquiry. Guidance on this choice will take place during the semester within this module informing you on which of these options to use as the basis of the summative assessment submission.	**BA(Hons) Marketing** **Knowledge & Understanding:** • Apply knowledge of contemporary professional practice in marketing informed by theory and research. **[PLO 5.1.1]** **Intellectual / Professional skills & abilities:** • Produce evidence of self-reflection as a means of informing personal development planning. **[PLO 5.3.1]** • Demonstrate skills and attitudes for progression to post-graduate contexts including professional work, entrepreneurship and higher level study. **[PLO 5.3.2]** **Personal Values Attributes** (Global / Cultural awareness, Ethics, Curiosity) (PVA): • Apply and evaluate innovative project work and research. **[PLO 5.1.3]**

• Reflect on your own ethical values as a researcher in the marketing discipline. **[MLO5]**	All students will on the programmes listed submit this summative assessment, i) as demonstration of their development as researchers with an ability to plan a major piece of independent research, but ii) it is recognised that a number of you will take a year out between Levels 5 and 6 where opportunities that arise may result in you wishing to change you research plans in Level 6 and iii) some of you will successful be placed at Level 6 on the Undergraduate Consultancy Project. The module learning and summative assessment experience will still be of benefit here, albeit the output of the summative assessment less explicitly. The 2,500 word summative assessment will cover module learning outcomes **MLO1-MLO5** inclusive.	• Develop an awareness of the cultural and ethical contexts in which international business operates. **[PLO 5.1.4]** • Apply creative and critical thinking skills that involve independence, understanding, justification and the ability to challenge the thinking of self and others. **[PLO 5.2.2]** **BA(Hons) Business and Marketing** **Knowledge & Understanding:** • Apply knowledge of contemporary professional practice in business and marketing informed by theory and research. **[PLO 5.1.1]** **Intellectual / Professional skills & abilities:** • Produce evidence of self-reflection as a means of informing personal development planning. **[PLO 5.3.1]** • Demonstrate skills and attitudes for progression to post-graduate contexts including professional work, entrepreneurship and higher level study. **[PLO 5.3.2]** **Personal Values Attributes** (Global / Cultural awareness, Ethics, Curiosity) (PVA):

		• Apply and evaluate innovative project work and research. **[PLO 5.1.3]** • Develop an awareness of the cultural and ethical contexts in which international business operates. **[PLO 5.1.4]** • Apply creative and critical thinking skills that involve independence, understanding, justification and the ability to challenge the thinking of self and others. **[PLO 5.2.2]**

Pre-requisite(s) (SRS 0007) Any module which must already have been taken, or any stipulated level of prior knowledge required in order to study this module, (co-requisite core models need not be listed	None
Co-requisite(s) (SRS 0008) Modules at this level which must be taken with this module	None

Module abstract (SRS 0009)

Please provide a brief a brief abstract of the module (150 words max). This section acts as the 'shop window' for the module, therefore it needs to engage and inspire the student. This is the first thing that the student will read about this module, so it must immediately grab their attention. The main aim is to encourage the student to read on, however the summary should be written in such a way that if the student reads nothing else this section will convey all key messages and benefits that the module will offer. Start by explaining the module title where necessary. Then highlight any selling points relating to the four pillars: Research-Rich Learning; Technology Enhanced Learning; Assessment and Feedback; Employability and Entrepreneurship. Examples may include student satisfaction rates, learning environment, state-of-the-art facilities etc. Finally indicate benefits of the module such as the key skills that the students will gain for future employment and career paths that are open to them.
This module will provide you with a significant appreciation of research methods and analysis before you undertake work placement, study abroad and progress to your "capstone" final-year research activity; one of Dissertation, Management Enquiry or Consultancy Project. You will engage in and reflect on practical research-based activities to facilitate your understanding of the process of designing and executing business research, gaining hands-on experience in the analysis of qualitative and quantitative research data. You will gain an appreciation of the central role of ethics in research. The module is research oriented primarily, but linkages to the work of marketing academics, will expose you to research tutored approaches. The summative assessment within the module represents an explicit engagement with a research problem, thereby facilitating experience of enquiry-based learning. Your ability to handle both qualitative and quantitative data will develop competencies that are directly applicable to research-based study at Undergraduate and Postgraduate levels, equipping you with a capability increasingly valued by businesses. The comprehensive research skills developed in this module will be critical in developing your ability to execute research-based study relating to business, management and marketing.

Programme Framework for Northumbria Awards Research Rich Learning Design Pillar (SRS 0090)

Embedding Research Rich Learning into the curriculum: Indicate how students will be actively engaged in research rich learning in this module through: research/enquiry based learning, research tutored learning, research led learning and/or research oriented learning, providing a brief overview of how this / these will feature within the delivery of the module (250 words max)

Note:

- **Research/enquiry Based:** L&T Based on student-centred enquiry and research activities (conducting research).
- **Research Tutored**: L&T Emphasises learning focused on students actively discussing research, and critically engaging with research outputs
- **Research Led**: T&L structured around subject content and that content is based on the research (learning about research)
- **Research Orientated:** T&L Emphasises understanding of the knowledge production process, and methods of enquiry in the subject (learning how to research)

As this module seeks to develop your capability as a researcher in the academic sense, research-rich learning is central to your learning experience. You will experience a significant development in research methods that will prepare you for your research proposal assessment and for the later stages of your programme when you undertake one of a Dissertation, Consultancy Project or Management Enquiry. You will gain practical experience of how to collect and analyse data using a range of quantitative and qualitative techniques and this work will be supported using appropriate software where appropriate, for example SPSS (or an equivalent) for quantitative data analysis. In developing your understanding of knowledge production and methods of enquiry in the marketing discipline, you are learning how to research, so are being exposed to research-orientated learning. There will be emphasis in the module on enquiry-based learning where you will be actively researching a chosen topic within the marketing discipline. You move from being part of the 'audience' and become the 'participant' in your own research project. This will involve active implementation of the techniques introduced in your 'research-orientated' learning. Within your formal classes, you will discuss and critically evaluate research outputs from the marketing arena, hence engaging in research-tutored learning, whilst your independent study will involve you undertaking wider reading in both the marketing discipline and in research methods, thereby experiencing research-led learning.

Notional Student Workload (NSW) for each mode of delivery

Complete for each delivery mode where the distribution of NSW **Full Time Mode of Delivery**				**Part Time Mode of Delivery**			
Activity type	**Hours**	KIS category	KIS category hours		**Hours**	KIS category	KIS category hours
Lecture	12	Scheduled	48	Lecture		Scheduled	
Seminar	12			Seminar			
Webinar	12			Tutorial			
Project Supervision				Project Supervision			
Demonstration				Demonstration			
Practical classes and workshops	12			Practical classes and workshops			
Supervised time in studio/ workshop				Supervised time in studio/ workshop			
Fieldwork				Fieldwork			
External visits				External visits			
Tutor guided independent learning	48	Independent	152	Tutor guided independent learning		Independent	
Student independent learning	104			Student independent learning			
Placement		Placement		Placement		Placement	
Study abroad				Study abroad			
Work based learning				Work based learning			
Total workload *200 hours for 20 credit module*	*200*		*200*	**Total workload**			

Summative Assessment

Sequence *001, 002 etc.*	**Activity type** *indicate **ONE** of the following types:*	**Brief description of assessment (max.120 characters)** *e.g. type/ length of exam, type/ word limit of coursework*	**Weighting** % or Pass/Fail (for grade only components) *Note: % weightings should add up to 100% for module overall*	**Final assessment**		**Anonymous submission**		**ESAF submission**	
				Yes	*No*	*Yes*	*No*	*Yes*	*No*
001	CW (Coursework)	A 2,500 individual assignment and reflective statement that provides a research plan for Level 6 study	100%	☒	☐	☐	☒	☒	☐
002	Choose an item.			☐	☐	☐	☐	☐	☐
003	Choose an item.			☐	☐	☐	☐	☐	☐
004	Choose an item.			☐	☐	☐	☐	☐	☐
005	Choose an item.			☐	☐	☐	☐	☐	☐
006	Choose an item.			☐	☐	☐	☐	☐	☐
007	Choose an item.			☐	☐	☐	☐	☐	☐
008	Choose an item.			☐	☐	☐	☐	☐	☐
009	Choose an item.			☐	☐	☐	☐	☐	☐
010	Choose an item.			☐	☐	☐	☐	☐	☐
011	Choose an item.			☐	☐	☐	☐	☐	☐
012	Choose an item.			☐	☐	☐	☐	☐	☐

Reassessment (specify either synoptic or non-synoptic)

Synoptic reassessment *One form of reassessment that tests all module learning outcomes*	Yes	☐	No	☒
Non-synoptic reassessment *Where module referred overall, individual failed components of assessment are reassessed*	Yes	☒	No	☐

FOR OFFICE USE ONLY

Date of FPARSC Approval Click here to enter a date.

Date of entry onto SITS	Click here to enter a date.

LOG OF CHANGES POST-APPROVAL

Please indicate any changes to the approved module descriptor from 2012/13 onwards

Section No.	**Brief description of change**	**Date of Approval**	**Semester and year of first implementation**
		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	
		Click here to enter a date.	

Appendix 1

Indicative Reading for PFNA alignment approval only *(to be completed only if e-reading list unavailable at point of alignment approval)*

N.B. This outline indicative reading list will be utilised for approval purposes only, and **a full e-reading list must be produced and available by the June of the academic year prior to the first delivery date of the module** (at which point the section of p.2 referring to University Library Reading Lists should be completed).

Please list below essential key text underpinning the module content and ultimately the learning outcomes:

Core Text

Saunders, M.N.K., Lewis, P. and Thornhill, A. (2019) Research Methods for Business Students. 8th Edition, Pearson.

Recommend Texts

Bell, E., Bryman, A., & Harley, B. (2018). Business Research Methods. Oxford University Press.
Bryman, A. & Bell, E. (2011). *Business Research Methods*. (3rd ed), Oxford: Oxford University Press.
Collis, J., & Hussey, R. (2014) Business Research, 4th Edition, Palgrave Macmillan.
Gray (2017) Doing *Research in the Business world*. London Sage.
Morris, C. (2012) Quantitative Approaches in Business Studies, 8th edition, FT Prentice Hall.
Wilson, J. (2014). *Essentials of business research : a guide to doing your research project (2nd Edition)*. Sage Publications.
Zikmund, W. G., Carr, J. C., & Griffin, M. (2013) Business Research Methods, 9th Edition. Cengage Learning.

Recommended Journals

European Journal of Marketing
Industrial Marketing Management
International Journal of Bank Marketing
International Marketing Review
International Review on Public and Nonprofit Marketing
Journal of Advertising
Journal of Advertising Research

Journal of Brand Management
Journal of Business and Industrial Marketing
Journal of Business Research
Journal of Consumer Marketing
Journal of Consumer Psychology
Journal of Consumer Research
Journal of Fashion Marketing and Management
Journal of Financial Service Marketing
Journal of Interactive Marketing
Journal of International Marketing
Journal of Marketing
Journal of Marketing Management
Journal of Product and Brand Management
Journal of Public Policy and Marketing
Journal of Retailing
Journal of Service Research
Market Intelligence and Planning
Marketing Letters
Nonprofit and Voluntary Sector Quarterly (NVSQ)
Psychology and Marketing

Recommended Databases

Business Source Premier (EBSCO)
Emerald
Ingenta
World Advertising Research Centre (WARC)